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modern plastics

PHOTO, COURTESY WALT DISNEY PRODUCTIONS

SEPTEMBER

Cellulosic plastics are the nurse, bottle, formula, mother and life itself to animated motion picture cartoons. The fascinating story of the role of transparent plastics in the existence of Mickey Mouse, Donald Duck, Pluto and other popular Walt Disney movie characters will be told in the September number.

Another major feature of the next issue will be a report by Douglas Ward, Irvington Varnish and Insulator Co., on developments in continuous extrusion of plastics for industrial and style applications.

AUGUST 1941

VOLUME 18 NUMBER 12

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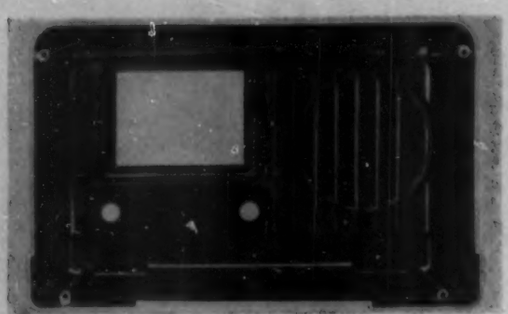
Published the 5th of each month by Breskin Publishing Corporation. Publication office, Twentieth and Northampton Sts., Easton, Pa. Executive and Editorial Offices, 122 E. 42nd St. (Chanin Bldg.), New York, N. Y. Phone AShland 4-0655. Mid-Western office, 221 N. LaSalle St., Room 1338, Chicago, Ill. Phone Randolph 6336. Pacific Coast Office, 427 West 5th St., Los Angeles, Cal. Cleveland, Ohio, Office, 1010 Euclid Ave.; telephone Prospect 2020. Also Publishers of Modern Plastics Catalog, Modern Packaging, Packaging Catalog. Subscription price $5.00 per year, $8.00 for 2 years in U. S., its possessions and South America. Canadian subscriptions $5.50 per year, $9.00 for 2 years, all other countries, $6.00 per year, $10.00 for 2 years, payable in American money or its equivalent. Price 50¢ per copy, except October issue, which is $2.00. Copyright 1941 by Breskin Publishing Corp. All rights reserved. Printed in U. S. A. Entered as second class matter May 28, 1940, at the Post Office at Easton, Pa., under the Act of March 3, 1879. Back numbers (except October) 3 months or more preceding current issue, when available, $1.00 each. Modern Plastics is fully protected by copyright and nothing that appears in it may be reprinted, either wholly or in part, without special permission.

Member of Controlled ABC Circulation Audit

Montgomery, Ward Model 624 Airline Radio. INSUROK cabinet, precision molded by Richardson.

Eye stopping beauty

. . . BUT MUCH MORE THAN THAT



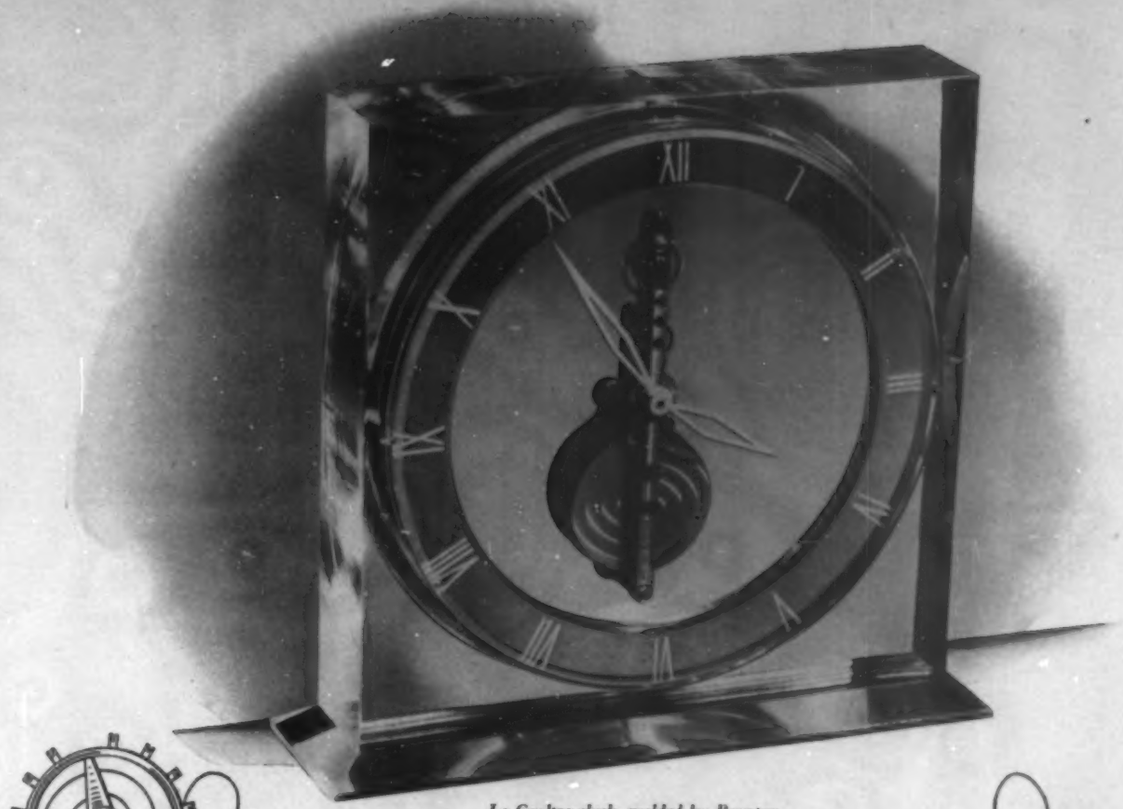
RICHARDSON TECHNICAL SERVICE
Users of plastics, or those who contemplate their use, are invited to bring their problems to Richardson. Here are maintained Research, Engineering and Design Laboratories, fully staffed by technicians whose sole interest is plastics. No obligation, of course.

THE CHINESE PROVERB about a picture being worth a thousand words finds full proof in modern merchandising. Today, as never before, eye appeal is a major requirement. To use INSUROK is to assure permanent beauty of your products because INSUROK, in its many colors and finishes, itself possesses inherent beauty. But, equally important to the production and sales minded executive, are the elimination of finishing costs, and corresponding unit economies. Thus users of INSUROK enjoy sharp production savings . . . and added beauty in the finished product.

PRECISON MOLDED

INSUROK

The RICHARDSON COMPANY



Le Coultre clock, molded by Boonton Molding Company for Longines-Wittnauer Watch Company

WHAT MAKES A CLOCK CLICK?

How one manufacturer found the answer in Du Pont "LUCITE"

EVERYBODY likes to see what makes 'em tick. At least, that's what a manufacturer of fine clocks decided. He designed a transparent case for one of his models . . . so it could tick away, naked and unashamed!

The case would have to be in a number of sparkling colors. It would have to be crystal-clear . . . light in weight . . . strong enough to last for generations. And, of course, it would have to be economical to produce. Could any one material fill this large order?

The manufacturer and his molder tried a number of materials, including "Lucite" methyl methacrylate molding powder. Sparkling "Lucite" passed every test easily. Crystal-clear, or in flashing ruby, topaz, sapphire or emerald colors, these cases of "Lucite" are making clock-watchers out of everyone that sees them. And, speaking of time, they can be injection-molded at the rate of six every hour—a rapid rate for an intricate piece $4\frac{3}{4}$" x $4\frac{3}{4}$" x $1\frac{1}{2}$"!

Three things can make any product click: a good idea . . . a willingness to experiment . . . and the right material. If you've got a good product idea, now's the time to start your experimenting. We'll be glad to assist you with samples of Du Pont plastics and with the services of our experienced technical staff. Write to: E. I. du Pont de Nemours & Co. (Inc.), Plastics Department, Arlington, N. J.

"LUCITE" IS REG. U. S. PAT. OFF.

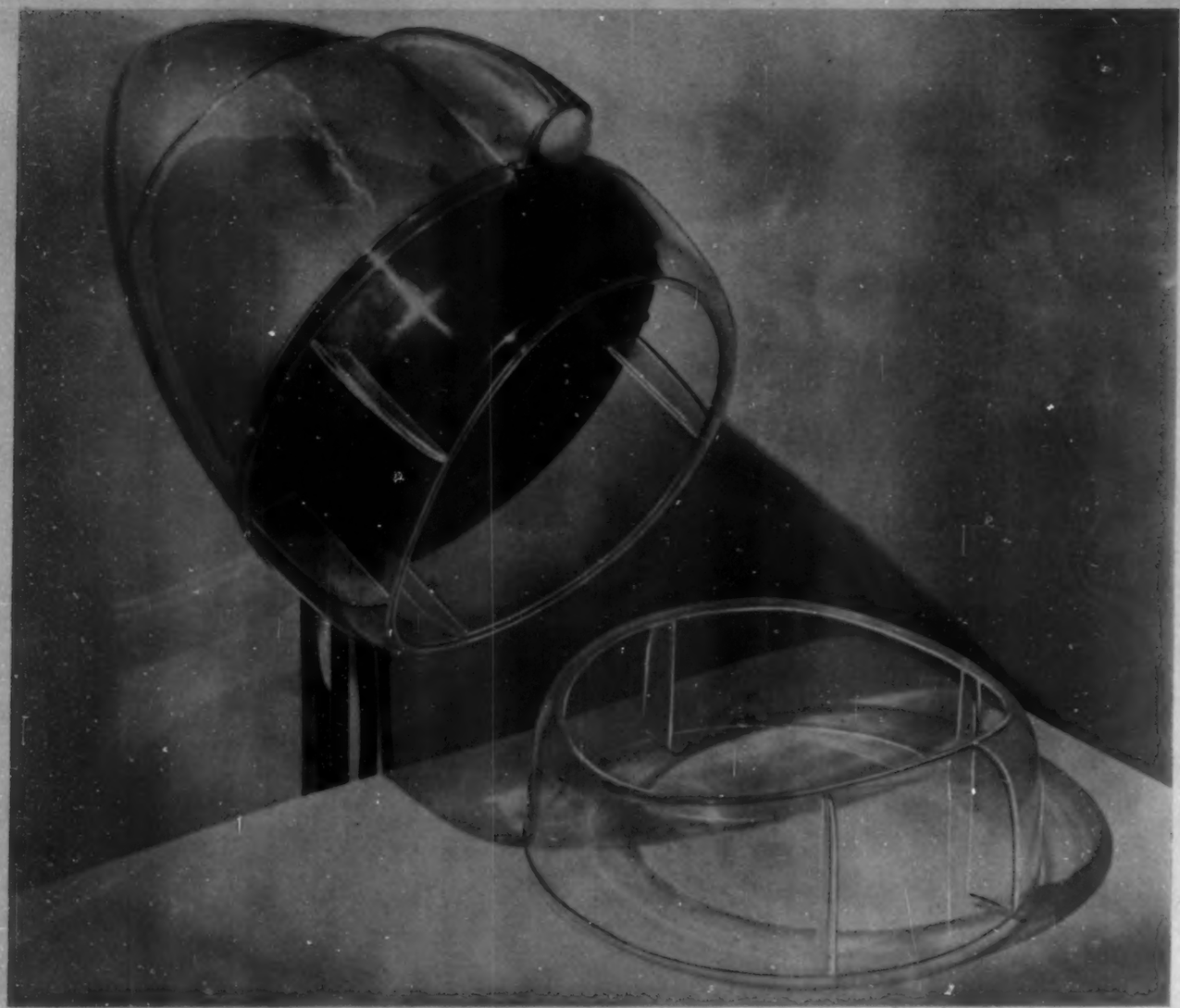
DU PONT PLASTICS

A STATEMENT BY DU PONT ABOUT PLASTICS

Defense requirements and unusual commercial demands exceed the supply of some Du Pont plastics. National Defense orders will get preferred attention, of course. But Du Pont is bending every effort to satisfy commercial replacement needs. Shortages of equipment and raw materials necessarily limit this effort.

Du Pont is also instituting a broad research and development program. We believe that from this program will come improvements in existing plastics and the creation of entirely new types with new and valuable properties.

Stories of Du Pont plastics applications and new developments will continue to appear in advertisements. We hope you will find it helpful to apply this information to your present and future needs. Meanwhile, experienced Du Pont technicians stand ready to devote their knowledge and facilities to your product problems.



This Story Won't Shock Your Wife--

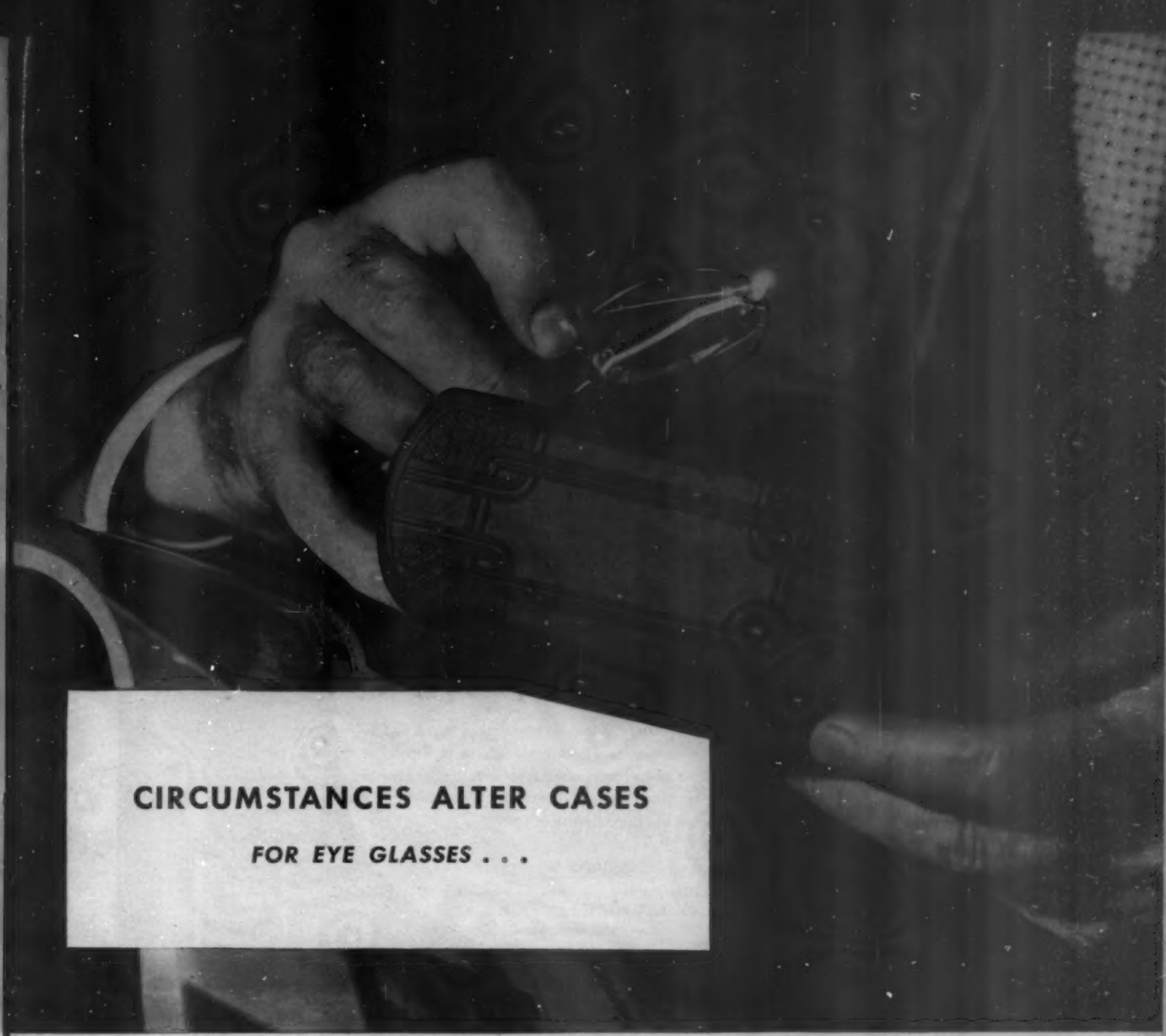
IT'S the story of cleanliness, visibility, and non-conduction of heat and electricity—features of modern plastics which make hair drying at the beauty shop a cleaner, safer, cooler task.

The customer is deGraff Products Distributing Company, the custom molder is Chicago Molded Products Corp., the material is Lucite. The teamwork of the three supplying design, molding technique and raw materials has led to a radically improved hair drying unit—one that can be cleansed with soap and water; one that will not become dull due to atmospheric conditions; that does away with deteriorating rubber in the rim; that provides protection from electrical shock, and reduces heat generally captured and held around the customer's face by metal predecessors. But more, the crystal clear transparent plastic adds new beauty to the unit and at the same time allows the patron full visibility in all directions while her hair is being dried.

Perhaps this application suggests a possible use of plastics for your products. As custom molders of all plastic materials, our development and engineering staffs are ready to serve you.

CHICAGO MOLDED PRODUCTS CORP.

1046 NORTH KOLMAR AVENUE CHICAGO, ILLINOIS



CIRCUMSTANCES ALTER CASES

FOR EYE GLASSES . . .

Plastics Make Them Better Than Ever

The circumstances are a shortage of metals. The cases are for eye glasses. The alteration is a complete new shell, injection-molded—snap lock, hinges and all—made entirely of cellulose acetate plastic. Everybody's happy, because the many valuable properties of cellulose acetate plastic make it ideal for this use, as for so many others.

APPEARANCE. Cellulose acetate plastic looks good and feels good. There is a limitless variety of colors—brilliant, pastel, opaque, translucent, and sparkling crystal.

STRENGTH. Resistance to impact and abrasion, resilience, and toughness, are truly amazing.

LOW COST. Ease of molding on the fastest automatic machines adapts cellulose acetate plastic for quantity production of low-priced articles. Built-in color and smooth surface save finishing costs; scrap can be used again.

VERSATILITY. Eye-glass frames, tool handles, bathroom fixtures, salt shakers, builders and automobile hardware, costume jewelry, toys and novelties . . . these are only a few of the uses that establish cellulose acetate plastic as the most adaptable of them all.

There are still countless opportunities for improving the appearance and utility of products by using cellulose acetate plastic. Because of exceptional experience and skill in manufacturing, Hercules Cellulose Acetate Flake offers advantages as a base for molding powders. Specify that your molding powders be made with this material. For more information about it, write to Department MP-8 for a free booklet, "Hercules Cellulose Acetate."

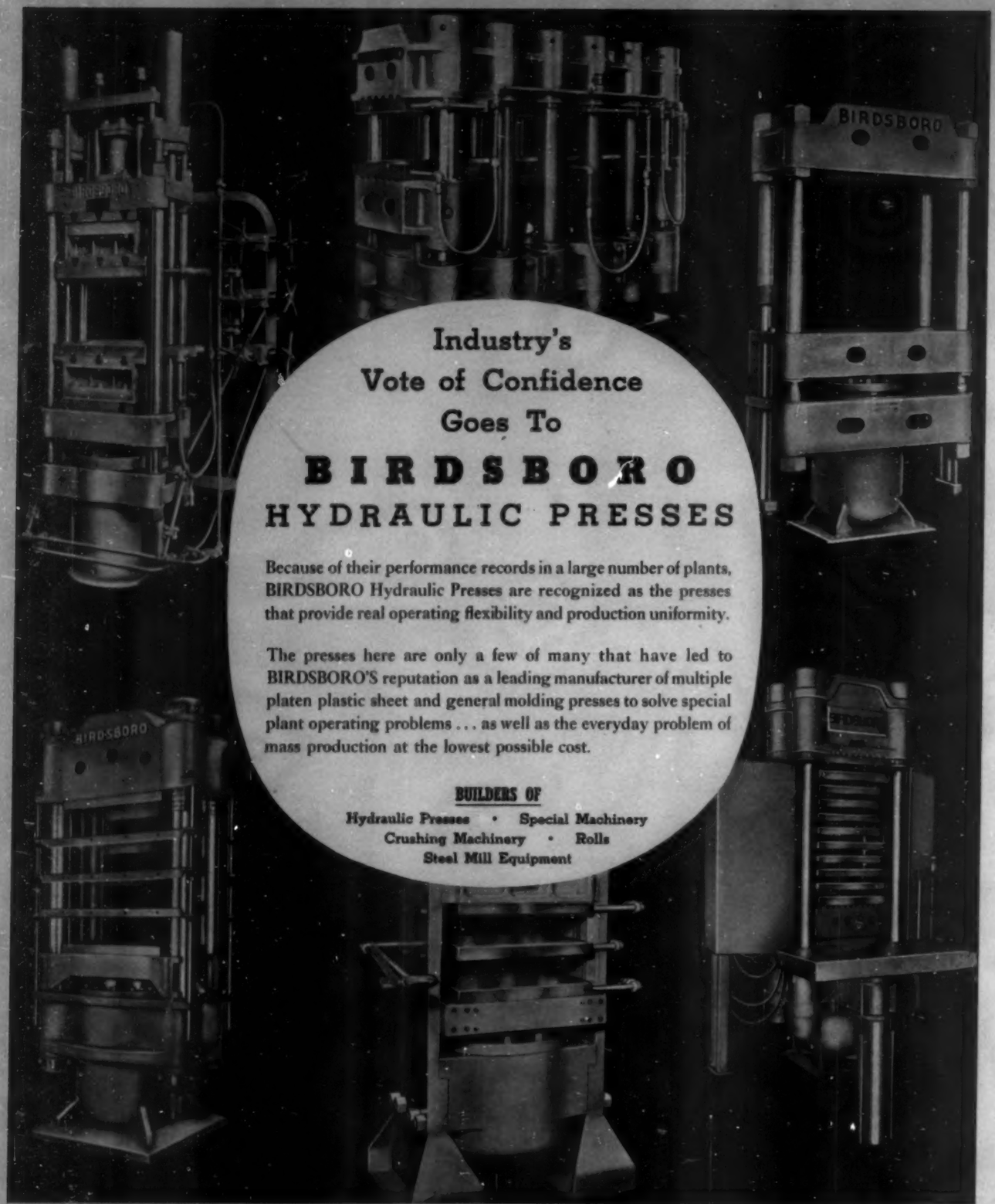
HERCULES

CELLULOSE ACETATE

HERCULES POWDER COMPANY · WILMINGTON · DELAWARE

Incorporated

DDD-49



Industry's Vote of Confidence Goes To

BIRDSBORO HYDRAULIC PRESSES

Because of their performance records in a large number of plants, BIRDSBORO Hydraulic Presses are recognized as the presses that provide real operating flexibility and production uniformity.

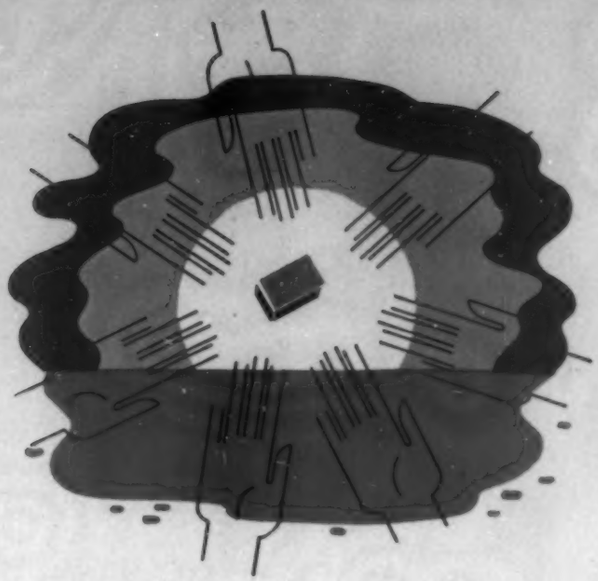
The presses here are only a few of many that have led to BIRDSBORO'S reputation as a leading manufacturer of multiple platen plastic sheet and general molding presses to solve special plant operating problems . . . as well as the everyday problem of mass production at the lowest possible cost.

BUILDERS OF

Hydraulic Presses • Special Machinery
Crushing Machinery • Rolls
Steel Mill Equipment

BIRDSBORO *Hydraulic Presses*

THE BIRDSBORO STEEL FOUNDRY AND MACHINE COMPANY • PLANTS AT BIRDSBORO AND READING, PA.



YOURS THE PREFERRED STOCK

Where goods "of a feather flock together", the product fabricated with Marblette is generally preferred. For among the many modern plastics, this particular phenolic is outstanding in elegance. Colors are cleaner and more true in Marblette, and its rich, deep luster rivals the beauty of costly gems. To place your product in the enviable, more profitable position of preferred stock, investigate the opportunities offered by Marblette.

MARBLETTE

a pure phenolic resin without fillers, is available in sheets, tubes, rods and special castings . . . hundreds of colors in translucent, opaque, clear and mottled tones.

MARBLETTE CORPORATION 37-21 THIRTIETH STREET LONG ISLAND CITY NEW YORK

sales offices: chicago, illinois • los angeles, california • toronto, canada • havana, cuba

NEW TIMES
NEW IDEAS

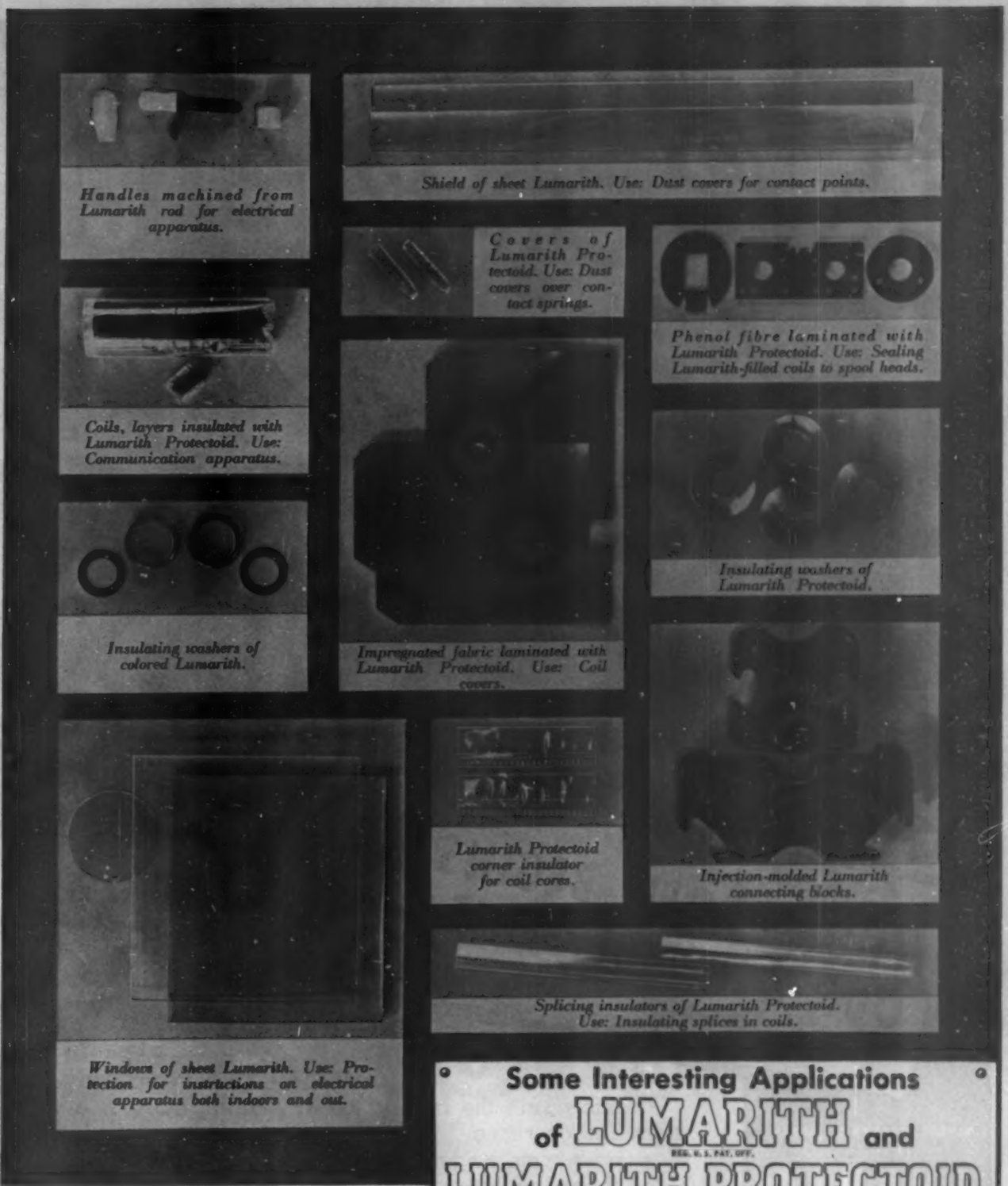
It takes more brains to make advertising and selling fit industry's needs now. Some men we know are doing it well. If you want to learn to use advertising more effectively, plan to swap ideas with other wide-awake men at the 1941 three day N.I.A.A. Conference in September at the Royal York Hotel, Toronto, Canada. A new setting, a thousand executives, and speakers of international reputation.

Make this note in your diary

19th ANNUAL N.I.A.A. CONFERENCE
TORONTO, CANADA · SEPTEMBER 17, 18, 19

NATIONAL INDUSTRIAL ADVERTISERS ASSOCIATION, INC.

100 EAST OHIO STREET CHICAGO, ILLINOIS


Handles machined from Lumarith rod for electrical apparatus.
Shield of sheet Lumarith. Use: Dust covers for contact points.
Covers of Lumarith Protectoid. Use: Dust covers over contact springs.
Phenol fibre laminated with Lumarith Protectoid. Use: Sealing Lumarith-filled coils to spool heads.
Coils, layers insulated with Lumarith Protectoid. Use: Communication apparatus.
Insulating washers of Lumarith Protectoid.
Insulating washers of colored Lumarith.
Impregnated fabric laminated with Lumarith Protectoid. Use: Coil covers.
Lumarith Protectoid corner insulator for coil cores.
Injection-molded Lumarith connecting blocks.
Splicing insulators of Lumarith Protectoid. Use: Insulating splices in coils.
Windows of sheet Lumarith. Use: Protection for instructions on electrical apparatus both indoors and out.

Some Interesting Applications of LUMARITH and LUMARITH PROTECTOID in the Electrical Field

REG. U. S. PAT. OFF.

REG. U. S. PAT. OFF.

IF YOU are an electrical manufacturer — or a molder interested in the electrical field—you'll want to have full information about Lumarith and Lumarith Protectoid at your fingertips.

In dielectric strength . . . toughness . . . ease of processing . . . availability . . . and other equally important considerations, these two materials suggest immediate possibilities for more economical production and improved product performance. We have the data you want; our technical staff will be glad to work with you in the development stages. Write Celluloid Corporation, 180 Madison Ave., New York City. Established 1872. Sole Producer of Celluloid, Lumarith and Lumarith Protectoid. (Trademarks Reg. U. S. Pat. Off.)

To improve your product with plastics . . .

Get in touch with CELLULOID

YOUR PROFIT BEGINS ON OUR ASSEMBLY LINE

1876–1941
65 Years of Molding Experience

MOLDED PLASTICS DIVISION OF
AUBURN BUTTON WORKS
AUBURN, N. Y.

Assembly isn't the biggest job at Auburn, but it is a vitally important operation. Many molded plastic parts come from the presses complete and ready for use and require no assembly—but those that we do assemble receive as careful and exact attention as they would receive on your own assembly line.

Here at Auburn assembly is closely allied to final finishing and inspection. Trained workers, alert for the slightest imperfections, put your product together—assuring you of the Auburn quality that is the result of sixty-five years of molding experience combined with the perfection that means profit. On your next molded plastic job, it will pay you to consult an Auburn Engineer.

"THE EXTRAS YOUR MONEY BUYS AT AUBURN"

The Urgency of this Moment

Twenty-three years ago, when we had completed the production of some 168,000,000 pounds of nitrated cotton for the Allied armies in the last war, we began manufacturing plastics. Since that time we have pioneered many developments in the industry, and a number of leading molders and fabricators have come to depend on us for their exacting material requirements in both acetates and nitrates.

Once, again, the urgency of history is dictating, to a degree, what we must produce and where production be allocated. Concretely, this may mean that even our oldest customers may experience delays in the fulfillment of their orders. Our plant is working at complete capacity. Needless to say, only the common effort for which we are all sacrificing will cause the slightest dislocation in our customer relationships. But where Uncle Sam demands, we, as you, have no choice as Americans but to obey, and gladly, to the best of our ability.

NIXON PLASTICS

NIXON NITRATION WORKS, INC.

Mfrs: NIXON ACETATE MOLDING POWDERS • NIXONITE (acetate) and NIXONOID (nitrate) sheets, rods, tubes

NIXON • • • • • NEW JERSEY

H. J. FAHRINGER	C. B. JUDD	W. S. MOWRY	A. F. PERRY
1219 No. Austin Blvd., Chicago, Ill.	401 Laudermann Bldg., St. Louis, Mo.	126 Marsden Street, Springfield, Mass.	Leominster, Mass.
phone Esterbrook 4242	phone Chestnut 8495	phone Springfield 4-7121	phone Leominster 1011

There is a sudden rush of parts from metal to plastics—because there is no metal. Not all of these applications should be in plastics—and many headaches will result.

If your molder warns you of possible trouble and in spite of that warning you have to go ahead—all right—your experience may open new fields to play in.

If he doesn't—and your unpleasant results come unexpectedly by way of irate letters from customers or complaints from your shop foreman—your taste for plastics will turn sour in your mouth.

Plastics are a substitute for nothing else in the world—they have their own place and their own group of qualities.

Consider your chances carefully and move in full knowledge of what may go wrong.

Remember two more things—

Some plastic raw materials may be hard to get—pick one that shows the least chance of that.

The metal people are performing a patriotic service in giving up their commercial business to-day—willingly or not—and the time will come when they are going back after that same business with both fists swinging—and they deserve to get it.

Don't get in too deep with this plastics replacement—plan to swing the border line applications back to metal when you can.

"A Ready Reference for Plastics" written for the layman, is now in a new edition. If you are a user, or a potential user of molded plastics, write us on your letterhead for a copy of this plain non-technical explanation of their uses and characteristics.

BM
CO

BOONTON MOLDING COMPANY

MOLDERS OF PLASTICS · PHENOLICS · UREAS · THERMO-PLASTICS

BOONTON · NEW JERSEY · Tel. Boonton 8-0991

N. Y. Office—Chanin Bldg., 122 East 42nd Street, Murray Hill 6-8540

LIGHT-ACCURATE

FORMICA weighs half as much as aluminum and because it has a low co-efficient of thermal expansion and low moisture absorption it maintains its dimensions under widely varying conditions and is therefore suitable for parts that must be accurately machined.

As it has gained more experience with the material the aviation industry has been using it for more and more parts—and finding it an improvement over previous materials.

Recent new applications have been wing tabs, fluorescent panel boards visible in "black light" and a wide variety of machined pieces for use on the chassis, in propellers, as well as insulation for lighting, ignition and other electrical systems.

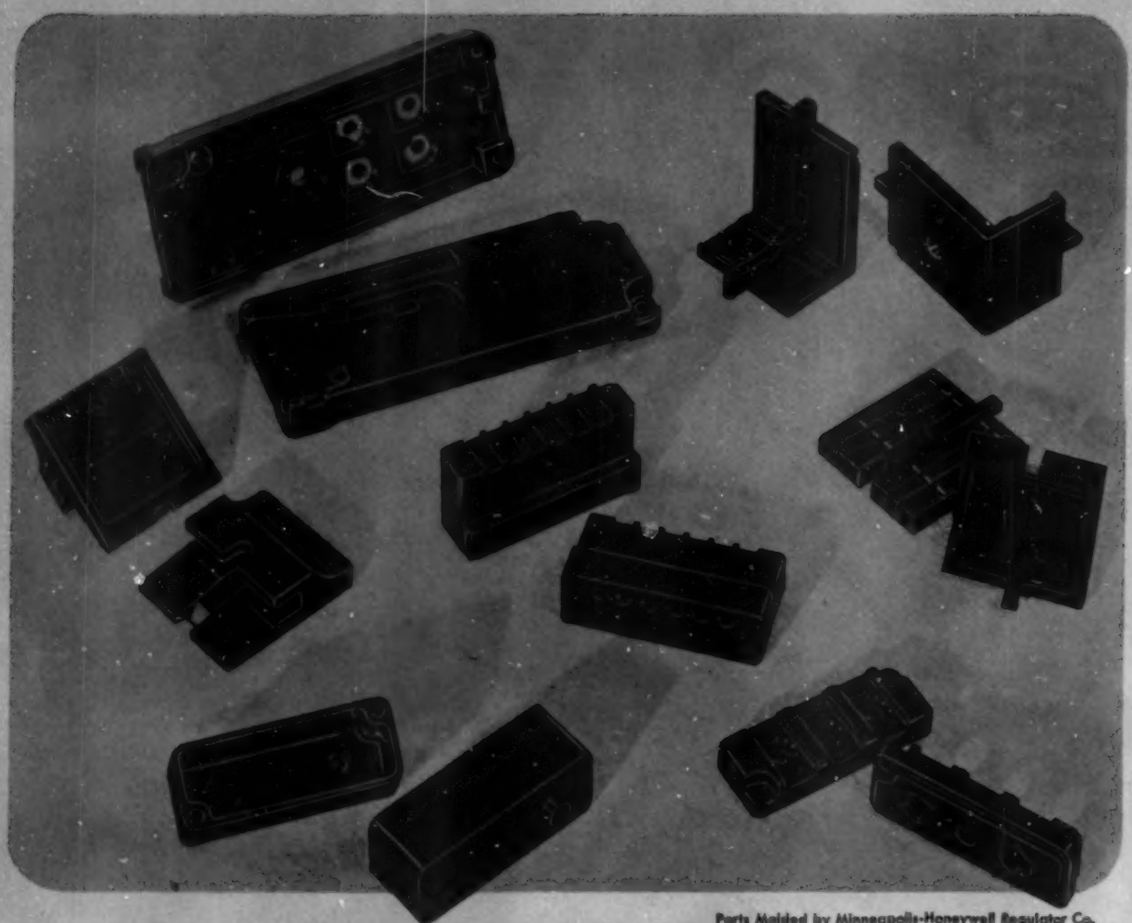
Let Formica engineers examine your blueprints and recommend suitable uses for the material.

FORMICA

The Formica Insulation Co.
4673 Spring Grove Ave., Cincinnati, O.

FORMICA
is used for—
PULLEYS
FAIRLEAD BUSHINGS
WING TABS
GUSSETS
STOPS
ELECTRICAL INSULATION
PANEL BOARDS
MACHINED PARTS

REILLY INDUR PLASTICS



Parts Molded by Minneapolis-Honeywell Regulator Co.

REILLY INDUR molding powders are preferred by many leading manufacturers of electrical equipment and appliances for their high dielectric qualities and their uniform adherence to specifications.

Combining unusual structural strength with smooth moldability (requiring minimum finishing and polishing), these plastics offer many production advantages and economies to the molder.

REILLY-INDUR is available in a wide selection of solid colors, and in pleasing mottles. The color range runs from deep rich reds, blues, greens and browns to lustrous blacks.

We shall be glad to submit samples to your specifications, and prices upon request.

Reilly
COAL TAR PRODUCTS

REILLY TAR & CHEMICAL CORPORATION

Executive Offices: Merchants Bank Building, Indianapolis, Indiana

1013 S. DAMEN AVENUE, CHICAGO, ILLINOIS — 500 FIFTH AVENUE, NEW YORK, N. Y. — ST. LOUIS PARK, MINNEAPOLIS, MINN.

FIFTEEN · PLANTS · TO · SERVE · YOU

ASSEMBLY SPEED HITS A NEW HIGH

WITH THE Speed Nut System (PATENTED)

To speed production—use the fastest thing in fastenings. SPEED NUTS and Speed Clips not only speed up your assembly, but also cut the number of parts in half, reduce weight and provide a DOUBLE SPRING TENSION LOCK TO PREVENT VIBRATION LOOSENING.

Manufactured in over 700 shapes and sizes to hold bolts, screws, rivets and studs. Made for metal, wood, ceramic or plastic applications. In hundreds of mass production products, the SPEED NUT has answered the call for a finer, faster assembly at about half the total net cost.

Simply send us your assembly details and we will furnish samples and engineering data promptly.

TINNERMAN PRODUCTS, INC. 2048 FULTON ROAD, CLEVELAND, OHIO

Manufacturers of Patented SPEED NUTS

IN CANADA: Wallace Barnes Co., Ltd., Hamilton, Ont. IN ENGLAND: Simmonds Aerocessories, Ltd., London IN FRANCE: Aerocessoires Simmonds, S. A., Paris

OVER A BILLION IN USE—OVER 700 SHAPES AND SIZES

Entries now being taken for

SIXTH ANNUAL
MODERN PLASTICS COMPETITION

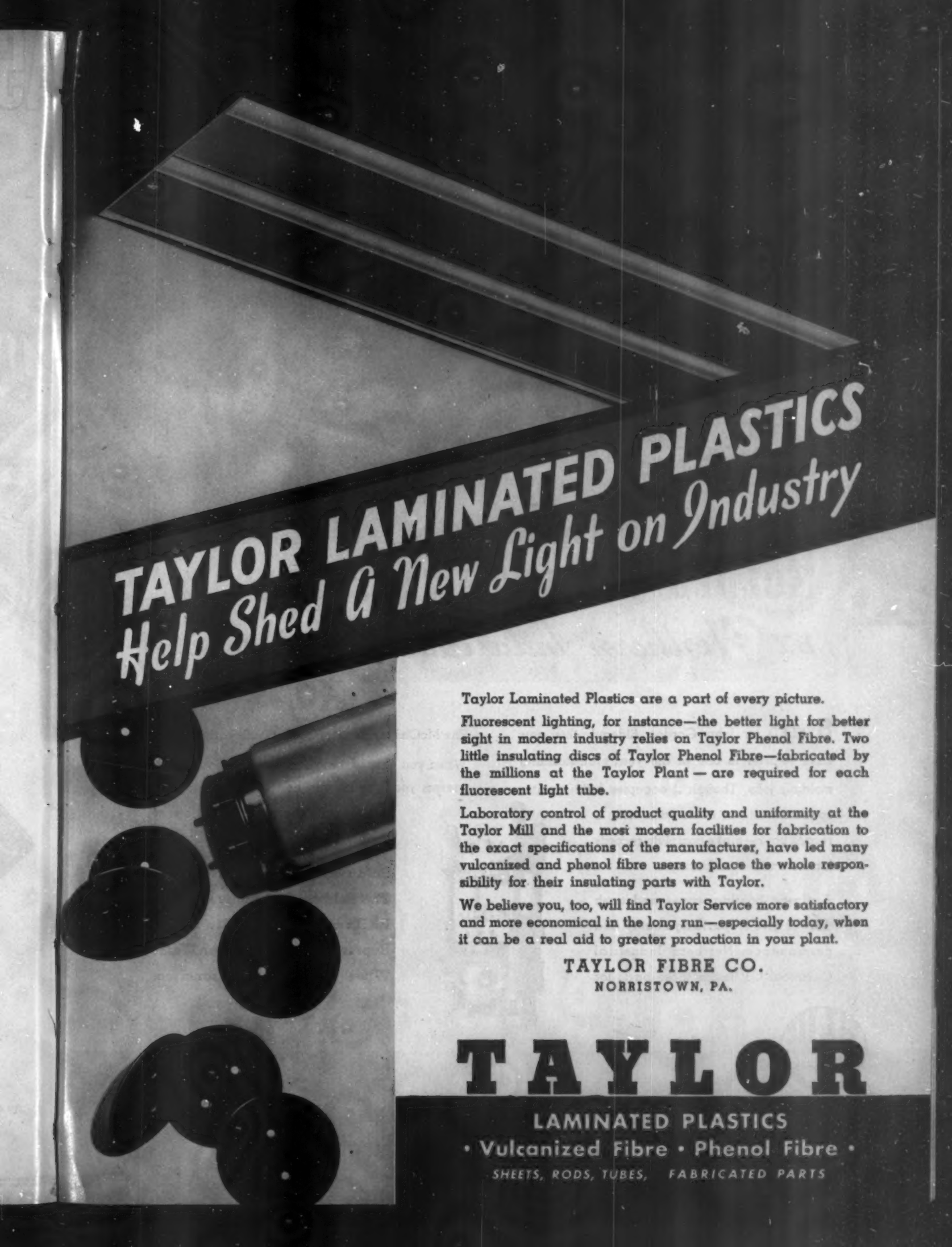
With the winners of last year's Modern Plastics Competition reaping an ever-increasing harvest of public acclaim and prestige as the first exhibit ever to be taken to consumers at point of sale, the announcement of this year's Competition has already met with a great response from the plastics field. Last year's winners have already appeared before the public in Washington, D. C., New Orleans, Minneapolis, Boston, Dayton, Pittsburgh, Wheeling and Chicago, with stops scheduled in every major city in the United States. They have been seen, read and heard about by 60,000,000 people through news stories, pictures, advertisements, motion pictures and radio broadcasts.

You owe it to your company and to the plastics industry to give fullest representation to all contributions to plastics progress. Every new application, new design, new material, new molding may be entered by molders, material manufacturers, press manufacturers, designers, laminators, marketers of the finished product.

There is no cost nor obligation for entering as many parts as you wish.

Merely write for as many entry blanks as the number of entries you plan to make. Full directions are on each entry blank.

6th ANNUAL MODERN PLASTICS COMPETITION
122 East 42nd Street **New York City**



TAYLOR LAMINATED PLASTICS
Help Shed A New Light on Industry

Taylor Laminated Plastics are a part of every picture.

Fluorescent lighting, for instance—the better light for better sight in modern industry relies on Taylor Phenol Fibre. Two little insulating discs of Taylor Phenol Fibre—fabricated by the millions at the Taylor Plant — are required for each fluorescent light tube.

Laboratory control of product quality and uniformity at the Taylor Mill and the most modern facilities for fabrication to the exact specifications of the manufacturer, have led many vulcanized and phenol fibre users to place the whole responsibility for their insulating parts with Taylor.

We believe you, too, will find Taylor Service more satisfactory and more economical in the long run—especially today, when it can be a real aid to greater production in your plant.

TAYLOR FIBRE CO.
NORRISTOWN, PA.

TAYLOR

LAMINATED PLASTICS
• Vulcanized Fibre • Phenol Fibre •
SHEETS, RODS, TUBES, FABRICATED PARTS

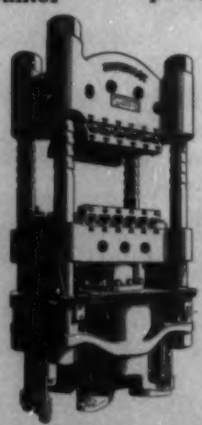
CASHING IN ON QUALITY

MOLDED ON SOUTHWARK PRESSES
BY *Northern Industrial Chemical Co.*

STYLED by John Gordon Rideout, this new cash register is one of the year's outstanding molding jobs. Though it occupies little counter space it will—in connection with a record book—make complete records for the one-record business.

A plastic housing, cover and cash drawer give it sparkling beauty and permanence. Northern Industrial Chemical Co. molds these parts for The McCaskey Register Co. on Southwark presses.

When you choose a molder who uses Southwark presses you'll be certain he is equipped to give you uninterrupted production of quality products.



Baldwin Southwark Division of The Baldwin Locomotive Works, Philadelphia; Pacific Coast Representative, The Pelton Water Wheel Company, San Francisco.

THE BALDWIN GROUP

SOUTHWARK PRESSES

IDEA OUTPUT

...Give your designers some samples of Monsanto Plastics

There's something about Monsanto Plastics that seems to generate profitable new ideas. Someone says, "Let's try plastics" for lighter weight, or color, or for any of a half dozen other reasons. Then, from that start, more ideas keep sparking until you usually end up with a far better product *and* with a simpler, faster way of manufacturing it!

For example—this new four-in-one screwdriver.

Tough, sturdy, Fibestos (Monsanto's cellulose acetate) is used for the hollow handle. That adds color to a prosaic product. But more—this Fibestos handle is *transparent*, making it possible to carry four interchangeable bits *always in sight* and near at hand to fit almost any type of conventional or star-slotted screw head you're likely to meet. No need to load a tool kit with a number of different screwdrivers... just a simple twist of the wrist, and the one you're holding becomes the one you need!

And just about that simple is the way these new screwdrivers are manufactured.

In one smooth, swift operation the handle is molded right around the steel shaft with a one-shot process worked out by the Worcester Moulded Plastics Company for Parker Wire Goods Co., Worcester, Mass. Practically no finishing needed... assembly is merely a matter of adding the bits and fitting the simultaneously molded cap to the handle!

For information on any of the six Monsanto plastics, inquire: MONSANTO CHEMICAL COMPANY, Plastics Division, Springfield, Mass.

District Offices: New York, Chicago, Detroit, St. Louis, Birmingham, San Francisco, Los Angeles, Montreal.

THE FAMILY OF SIX MONSANTO PLASTICS

(Trade names designate Monsanto's exclusive formulation of these basic plastic materials)

LUSTRON (polystyrene) • **OPALON** (cast phenolic resin) • **NITRON** (cellulose nitrate) **SAFLEX** (vinylacetal) • **FIBESTOS** (cellulose acetate) • **RESINOX** (phenolic compounds)

LET'S GO! U.S.A. KEEP 'EM FLYING

MONSANTO PLASTICS

MONSANTO PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

Extra careful finishing protects REYNOLDS *plastic customers*

Reynolds makes certain that all plastic pieces are expertly finished exactly to customer's requirements . . . Whether thermosetting or thermoplastic, this is done by trained workers with great experience, who take great pride in giving that extra, careful touch that means customer satisfaction.

REYNOLDS MOLDED PLASTICS

CAMBRIDGE, OHIO, U.S.A.

DIVISION REYNOLDS SPRING COMPANY

JACKSON, MICHIGAN, U. S. A.

Plastics play an important part in the Douglas B-19, giant new Army bomber, as in many other modern aircraft.

1126½ [illegible] Street
Santa Monica, Cal.
May 1, 1941

Mr. M. A. Collins
Plastics Industries Technical Institute
186 So. Alvarado Street
Los Angeles, California

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Rodric P. Cuthbertson

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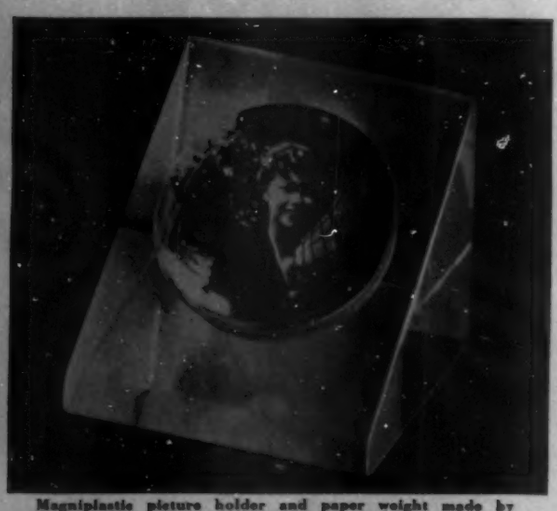

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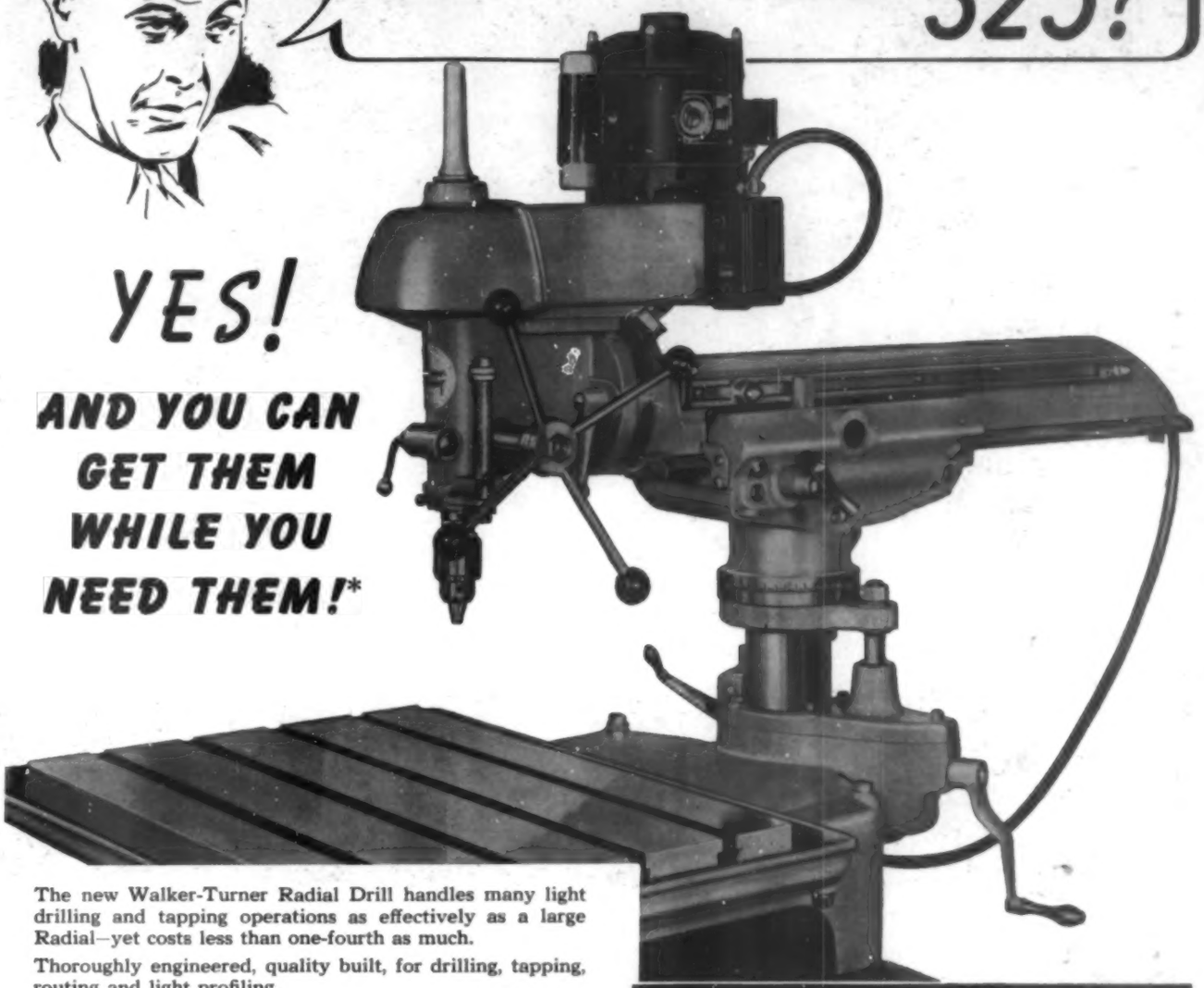

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Modern Plastics

WILLIAM T. CRUSE, Editor

AUGUST 1941 VOLUME 18 NUMBER 12

B-19—Air fleet leviathan

Clear sheet stock, molded and laminated plastics play an important role in creating a super bomber

PERHAPS the most outstanding achievement of America's wartime effort thus far is the B-19 Douglas Super Bomber, giant airplane built for the United States Army Air Corps and characterized as the "Guardian of a Hemisphere."

There could be no better name for the bomber when one considers its amazing capacity. In order to fully understand its strength, specifications must be set down. It has, for example, the longest range, greatest load-carrying capacity, and most powerful armament of any aircraft constructed in this country. The flying range is 7750 miles, or enough to fly from Los Angeles to London and return to New York without stopping. During this trip, the B-19 could carry enough bombs to administer a highly effective bombardment en route. The fuel tank capacity is 11,000 gallons, equal to the capacity of a railway tank car. Normal gross weight is 140,000 pounds, total load capacity, 28 tons; wing spread, 212 ft.; fuselage length, 132 ft. Compare these figures to similar dimensions for a commercial air lines airplane which usually has an overall wing spread 95 ft., and measures

64 ft. 6 in. in length—for a rough idea of its size.

While direct credit for the conception, engineering and construction of the B-19 rightfully belongs to the aircraft manufacturers, other industries have played vital roles in the success of the project. And plastics have played a major part throughout. The craft is powered by 4 Wright Duplex Cyclone engines which develop in all more than 8000 hp, equivalent to that generated by a 10,000 ton ocean liner. The ignition systems of these power plants depend upon the dielectric properties of plastics for operation. Spark plugs are energized and controlled by distributors insulated with, and having working parts made, of molded high-impact phenolic. The insulation on the electric energy distributing equipment and other parts of the B-19 is of polyvinyl chloride. The magnitude of the electrical system is more readily understood when one realizes that 2 generators developing 15 kw, or enough electricity to supply the needs of a department store, are necessary to operate the airplane.

The interior of this leviathan-of-the-air embodies features never seen before in an airplane. A large, soundproof, heated and ventilated bridge deck in the forward and upper section of the fuselage accommodates the ship's commander, navigator, radio operator, engineer, pilot and co-pilot. And here plastics of many types, used in a variety of applications, have been called into service. Control devices, for example, are of molded cellulose acetate. Navigation instruments are housed in compression molded thermosetting housings. The bridge, brain of the B-19, is augmented with a reliable, unfailing nerve system, in which plastic materials play no small part. The control cables, which reach every part of the craft, are held in place and directed by pulleys, cable tracks and fair leads made of phenolic laminated materials.

All of the combat stations as well as the bridge and cockpits are enclosed in transparent housings formed from acrylic resin sheet. The bombardiers' compartment, under the nose of the airplane, is fully protected by clear plastic sheet which permits the crew a full view of any target ahead or on either side. The nose turret, from which weapons are aimed and fired in varied directions, is completely enclosed with a formed transparent plastic shell.

Space is also provided for gunners. A small gunner's turret midship and a rear (*Please turn to page 94*)

PHOTOS, COURTESY DOUGLAS AIRCRAFT CO.

2

3

2—Transparent acrylic resin sheets insure ideal vision for marksmen positioned in strategic gun turrets. Rear gunner sits under the sky-scraper tail rudder. **3**—Dome-like plastic "blister" supporting the gun mount, is equally important for co-ordinated action. Discernible under the side of fuselage, is the observation post where constant watch is kept on the sky-ways

4—Military efficiency of the B-19 depends on precision and accuracy for successful expeditions. Methyl methacrylate resins, optically clear, used in cockpit, nose turret and the bombardier's compartment (above), provide minimum distortion and maximum vision for combatants sighting targets. The material, readily formed to exact tolerances, is peculiarly suitable for the intricately designed shapes of these vital sections of the plane and will withstand powerful air pressure at terrific speeds

1—Machining intricate injection molds used in molding plastic filter lenses for army truck convoys, demands utmost precision. A feature of this rotary milling machine is the spindle, mounted on cross slide, which can be regulated through adjustments closely controlling cutting tools to close tolerances

Blackout truck lights

BY H. A. FROMMELT*

We are happy to announce the first of a series of several articles now in preparation on Plastics in Defense, by H. A. Frommelt, director of Industrial Research of the Kearney and Trecker Corp. The first article deals with the application of plastics for filter lenses in dimming the lights of army trucks operating at night under virtually blackout conditions. Other articles in subsequent issues; will discuss some interesting plastic parts used in Army and Navy Air Plants.

PLASTICS are playing an important part in national defense. They will continue to do so at an accelerated rate as the present emergency levies upon our ingenuity for developing and processing materials.

Unfortunately, for many the word plastics is a synonym for substitute. Because we are presently experiencing a shortage of such vital raw materials as aluminum, tin and zinc, plastics for the uninitiated is a way out of our difficulties. Substitutions are being made and plastics are frequently the favorite materials for these purposes. On the other hand, it is more true to say that these newer materials are blazing a path of their own and finding applications that would be impossible in other materials solely because, for these purposes, plastics have inherently better characteristics and properties to do the jobs demanded of them.

For some purposes, and these are increasing daily as research brings them to the surface, a plastic material alone makes possible the projected device or method. An outstanding example is the filter lenses used for dimming the lights on army trucks operating at night. The application of plastics for this purpose is the subject of the first discussion in this series on the use of plastics for defense equipment. In a convoy of trucks operating at night under virtual blackout conditions and in territories within reach of the enemy air force, only the first truck operates with anything like normal headlights. All the following trucks are provided with blackout head and tail lights that provide only such illumination as is necessary for one truck to follow the truck ahead at safe distance. For this purpose special equipment must be provided both for front and rear lighting equipment of each truck.

* Director Industrial Research, Kearney and Trecker Corp.

There are 2 units used as auxiliary lights on the front fenders and 2 units for the rear of each army truck (See page 34). Fig. 4 shows the 3 parts of this unit, namely, the headlight case, the methyl methacrylate receptacle and the plastic filler made of cellulose acetate. The plastic filler transmits only as much light as is absolutely necessary for the driver to keep a safe distance from the truck ahead.

Illustrated in Fig. 5 are the essential parts necessary for each unit of the rear tail light. In the upper left-hand corner of Fig. 5 is the assembled parking light. The case for these 2 units is shown in the center with the plastic parts, both the filters and the lens, presented at the right center and bottom.

Molding procedures

The actual castings for the methyl methacrylate receptacle and the cellulose acetate filters are clearly presented in the right-hand illustrations of Fig. 4—both good examples of plastic molding technique. The filter to the upper right, Fig. 5, is a three-piece multiple casting injection molding job with the gating exactly as shown. The filters of cellulose acetate, as shown in the right center, are effectively hung on a "tree." This six-piece multiple casting is a good example of effective gating. The 2 lenses shown in lower right are from a four-piece multiple casting, gated as shown. All of these are injection molded.

Molding materials

Choice of materials was a judicious one since methyl methacrylate used in the castings has a transparency quite equal to that of glass and the cellulose acetate transmits only a very limited amount of light. Specifications on the latter material are held to close limits. Filters of cellulose acetate are checked for light transmission in a photo-electric measuring device. The first castings from each 500-lb. batch of the material are inspected in order to prevent difficulties from any possible variation in the material or molding processes. Choice of colors is likewise excellent for the job to be done. The cellulose acetate headlight filter is bluish gray. Color used for the parking light is deep red, while the filter for the blackout tail light is again of a bluish gray color.

Thus by the ingenious application of plastic materials on the front and rear lights of an army truck, so essential to modern mechanized warfare, it is possible to cover distances at night without danger from enemy aircraft. And this is only made possible because of the peculiar characteristics of plastics which provide the necessary light control.

The success or failure of any plastic application that involves the molding process depends largely upon the mold. This is axiomatic in the plastic industries and need not be further discussed. And this is true regarding the application of plastics to filters for head and tail lights because of the close limits to which the filter material must be held in order to transmit the prescribed minimum amount of light. The thickness of the filters in both the head and tail light in the area bounded by the Y-shaped aperture must be held to a plus or minus 0.001 in. Variations greater than this will permit either too much or too little light to pass through the filter and thus destroy its usefulness.

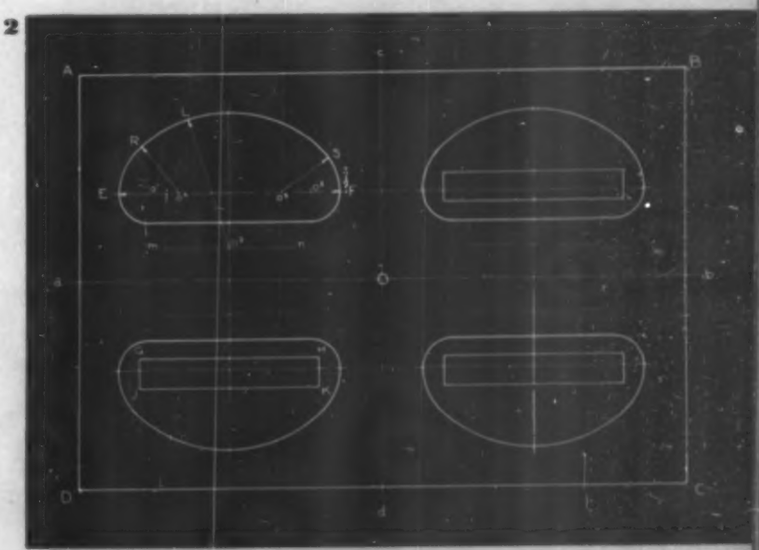
Mold making

The making of the mold for the filters and other plastic parts necessary for these head and tail light units becomes, therefore, the heart of this problem. The die milling machine on which the mold-making operations were performed is of the rotary head type. This precision machine tool took in its stride the limits imposed on the die by the plastic specifications referred to above.

The operation of this tool and die milling machine is readily explained from the illustrations shown. With its spindle carrying the end mill in a vertical position, the machine resembles a vertical milling machine, but the likeness ends with appearances. Its rotary head is

These diagrammatic mold cavity layouts detail the adjustment schemes for milling die cavities for the plastic lenses. 2—Engineering plan for the tail light lens which includes a rectangular cavity. 3—Scheme of operations for eliptical lens with a trapezoid cavity. A full description of the milling operations depicted below will be found on the following pages

2



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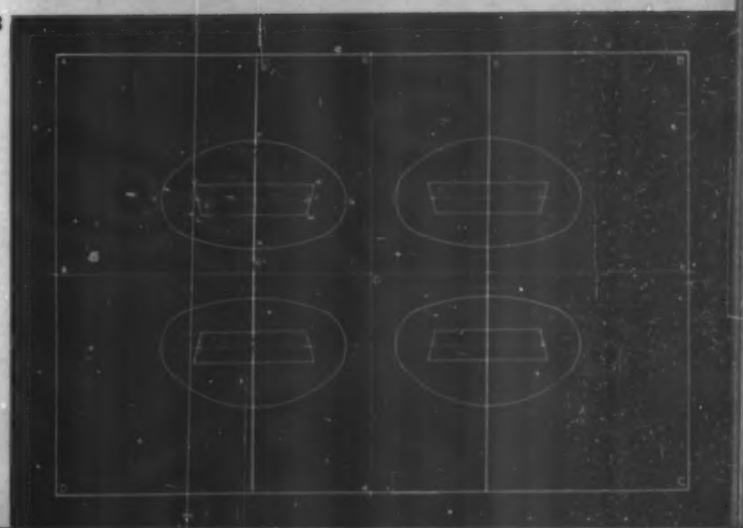

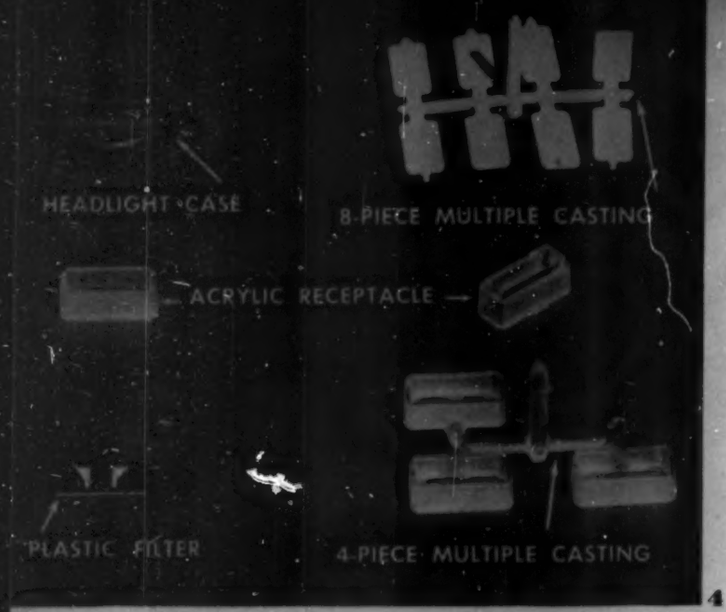

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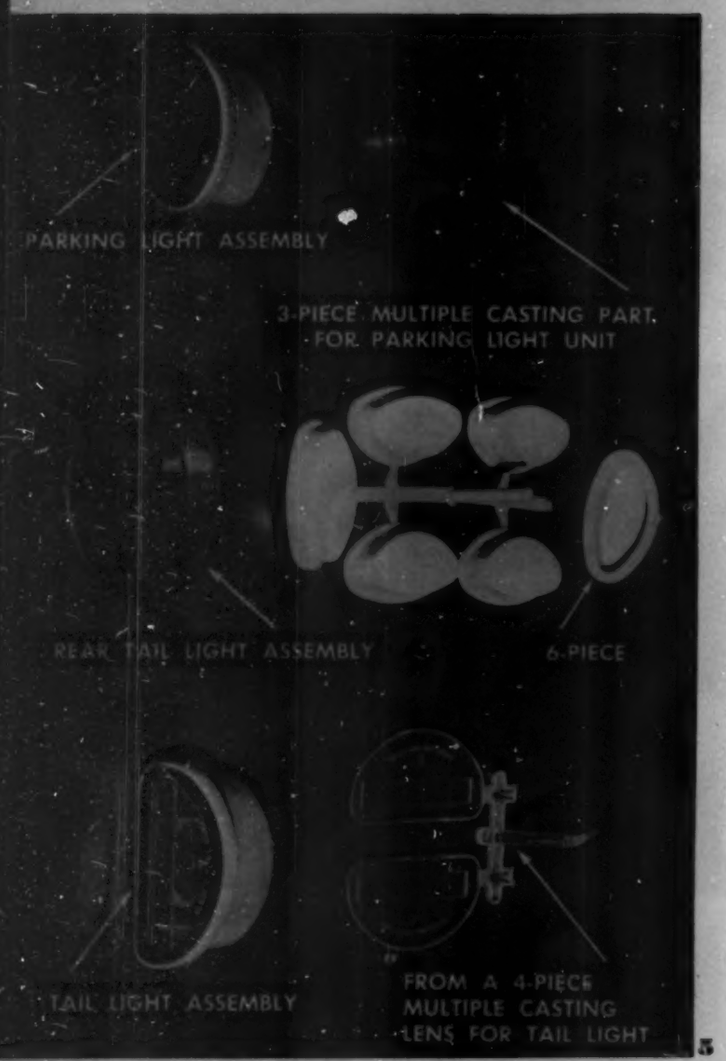

PARKING LIGHT ASSEMBLY
3-PIECE MULTIPLE CASTING PART FOR PARKING LIGHT UNIT
REAR TAIL LIGHT ASSEMBLY
6-PIECE
TAIL LIGHT ASSEMBLY
FROM A 4-PIECE MULTIPLE CASTING LENS FOR TAIL LIGHT

5

4—Injection molded parts for the complete truck headlight assembly including case, filter, receptacle and their sprues. 5—Essential plastic parts of the tail light shown on sprues to depict gating technique and also in position, partially assembled

the essential feature that revolutionizes the making of dies such as are necessary for these plastic parts. A description of the method used to mill the multiple cavity mold for the methyl methacrylate lens shown in Fig. 2 will serve to illustrate the interesting features of this die milling machine. The mold block, mounted, is indicated so that the center of the rotary head coincides with its center which is the intersection of the main center lines *a-b* and *c-d*, in Fig. 2. The centers for the small arcs at the lower right- and left-hand corners of the lens lie on the center line *E-F*. The table is now moved by means of precision screws a distance equal to that from *a-b* to *e-f*, so that the center of the head now coincides with the center line *e-f*. If the table is now moved longitudinally until the center of the head coincides with O^1, the first step in the milling of this cavity can be taken. Since the spindle is mounted on a cross slide, clearly visible in the illustration, Fig. 1, the center of the spindle can be precisely offset from the center of the rotary head. If then the spindle is offset a distance equal to the radius of $O'E$ less the radius of the end mill, the cutter is in a position to mill an arc whose radius is O^1E. A two-fluted end mill is now sunk into the steel block to the required depth, minus the necessary amount for finishing. The rotary head power feed is now engaged by throwing the directional control lever so that the head revolves counterclockwise. A circular cavity whose radius is O^1E can thus be milled.

When the head has revolved through 90 deg., which can be read on the graduated periphery, the longitudinal table feed is engaged and the straight line portion of the cavity is milled until center O^2 is reached. At this point the rotary head power feed is again engaged and the head revolves through a sufficient number of degrees to mill the arc whose center is at O^2.

The arcs whose radii are *O4R* and *O5S* are now milled using the same procedure as before. In other words the center of the head is located over *O4* and *O5*, respectively, and the cross slide is offset a distance equal to the radius minus the radius of the cutter.

The center of the large arc forming the top portion of the cavity is located on center line *m-n* and at O^3. The spindle is now brought back to zero which is indicated by the scale on the cross slide so that the center of the spindle and the center of the rotary head again coincide. The table is now moved transversely and longitudinally until the center of the rotary head rests over the center O^3. With the spindle cross slide offset a distance equal to the radius O^3L, minus the radius of the cutter, the operation to mill along the arc *RLS* is begun. Again the two-fluted end mill is sunk into the block to the required depth, minus amount for finishing. The rotary head power feed is engaged and the cavity along the arc is milled tangent to the other arcs.

The $^3/_8$ in. end mill used for the milling of the eliptical-shaped cavity is operated at a speed of 700 rpm. These spindle speeds are infinitely variable between 250 and 6000 rpm. The cavities shown are milled to a depth of 0.100 inches. (*Please turn to page 86*)

O. P. M. classifies plastics*

PREPARATORY to tightening the belt of the plastics industry defense effort, the Office of Production Management and the Office of Price Administration and Civilian Supply have drafted an allocation order which will restrict or prohibit the delivery of formaldehyde for the production of resins and plastics that would be used in manufacturing various items.

This order is based on an important survey by government offices from data supplied by raw material manufacturers, fabricators, producers of resins, laminators and trade molders who collaborated with the United States Government.

It has not yet been determined when the order will become effective or if, as a matter of fact, it will appear precisely as outlined at present.

In Defense and other essential categories the criterion will be one of functional essentiality and non-substitutability of these resins. The explicit intention of the order is to eliminate the utilization of plastics for novelties, gadgets and decorative items.

Definition of articles included in classification:

Synthetic resins using formaldehyde employed in producing plastics, coatings, adhesives, and miscellaneous binders ultimately employed in producing the following classes of articles. (Classifications A, B, and C include only those uses of resins essential to the function of the item or assembly classified and only those uses for which no satisfactory substitute is readily available at present.)

Categories established:

A. *Recognizable Defense Work—such as:*
- Airplanes
- Tanks
- Telephones, wireless, etc., used by military or navy
- Guns, Ammunition and ammunition carriers
- Binoculars for army and navy
- Marine finishes
- Automotive war equipment
- War vessels, merchant vessels, and component parts thereof
- Defense housing and construction contracted with Government Agencies
- Grinding wheels and other abrasive products
- Other functional materials, parts, and assemblies entering directly or indirectly at any stage of production into material for delivery carrying a preference rating of A-10 or higher, not included in above list.

B. *The following classifications—not included under A:*
- Public and industrial heat, light, power, and water equipment
- Transportation equipment, including commercial airplane accessories
- Trucks, buses, tractors, farm machinery, and fire fighting equipment
- Technical instruments
- Materials and equipment for chemical research
- Chemical protective uses
- Applications in the communications industry (telephone and telegraph)
- Industrial buildings and equipment
- Oil well equipment
- Applications in the mining industry
- Exterior durable finishes not already included
- Industrial containers, food and medicinal containers and coatings therefor
- Closures, except decorative

C. *The following classifications—not included under A or B:*
- Radio
- Household appliances
- Textile finishing applications
- Wiring devices—house
- Automotive (pleasure cars)
- Buttons
- Brushes
- Furniture
- Commercial cameras and photographic equipment
- Pipe stems
- Table and kitchenware, other than cups, plates, and tumblers
- Protective coatings, not otherwise specified
- Articles fashioned solely by hand from standard shapes

D. *The following classifications—not included under A, B, or C:*
- Amateur cameras and photographic equipment
- Hardware, such as drawer pulls and knobs
- Paper treatment where not functional
- Phonographs
- Smokers' articles
- Decorative articles, such as stationery, statuettes, bric-a-brac, and vases
- Tumblers, cups, saucers, and plates
- Premium and advertising items
- Novelties, jewelry, and toilet ware, except as in "C" (last item)
- Buckles and findings
- Displays, and display containers
- Escutcheon plates
- Picture frames
- Toys
- Games
- Minor utilitarian articles easily substitutable
- All other uses of resins, excluded from Classes A, B and C by the restrictions set forth in the brackets above.

* (ED. NOTE: As the August edition of Modern Plastics went to press the allocation order was being contemplated. It had not yet become operative.)

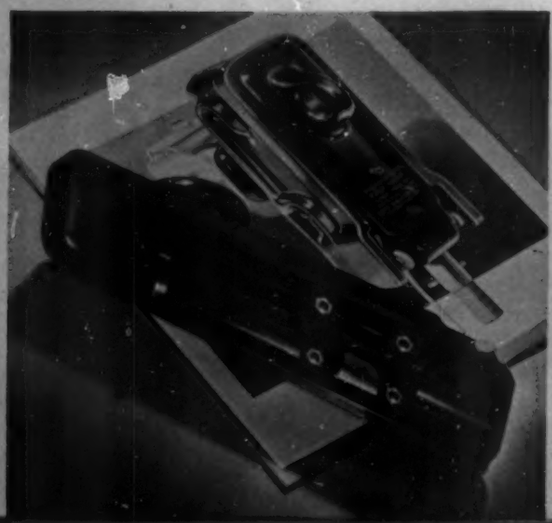
PLASTICS IN REVIEW

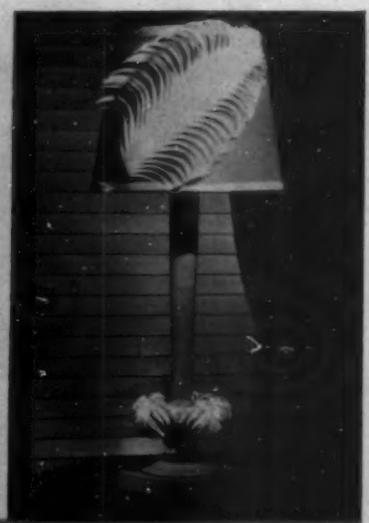
1 Garden lovers will find these tools with durable Tenite handles a hardy perennial in all kinds of weather. They will withstand rough usage and exposure without cracking or splitting. Since the color is an integral part of the material it cannot peel or wear off. Because of the low heat conductivity of the plastic, they will not become excessively hot. Molded by Ohio Plastics Co. for Union Fork and Hoe Company

2 Claimed to take the toughest blow without harm, these rugged cellulose nitrate hammer heads come in a variety of sizes. Machinists will find them excellent for pounding parts without marring surfaces. Heavier types are used for taking traffic dents out of steel automobile fenders. Manufactured from Nitron by R. and R. Plastic Products

3 Phenolics are doing a heavy-duty job by serving as a door on a fuse cutout for a large industrial concern. Because of the design, the door stays closed whether the cutout is in blown or fused position. The large loop, an integral part of the molded piece, serves as a pull ring for opening and closing. Door and carriage are removable from housing as one unit. Molded of Durez by Eclipse Moulded Products Co. for Line Material Company

4 Plastics lend that enviable custom-made look to the "Clair de Lune" lampshade. It is available in a range of soft pastel shades with a self-toned, or contrasting hand-worked Lumarith plume with matching velvet binding. The lamp itself is 20 in. tall, and reasonably priced. Made by Van Cleff





5 Offices that keep regular record charts will find Permo-Chart economical for daily use. They are fabricated from Vinylite, rigid sheet stock, easily laminated, and practically inflammable. Because of its durable dimensional stability, previous day's ink is easily removed and the record is clean. Sheets do not curl after washings and resist oils and gas

6 Grandmamma never dreamed of such convenience as a spool rack holding 18 standard spools of thread! Today, however, sewing is made that much easier and more fun because of a rack molded in either urea or phenolic materials. The one cavity mold is compression molded, but may later be turned out by injection molding. Molded by American Molding Company for D. S. Carr and Co. Designer, H. Goldschmidt

7 These are thirsty pens which drink enough ink to write a manuscript page without dipping. The single and double sets are of molded phenolic and incorporate an important mechanical development—a live rubber washer which sits on a solid shelf all the way around the well so that ink evaporation is held at a minimum. Molded of Durez by Martindell Molding Co. for Esterbrook Pen Co. Martial and Scull, designers

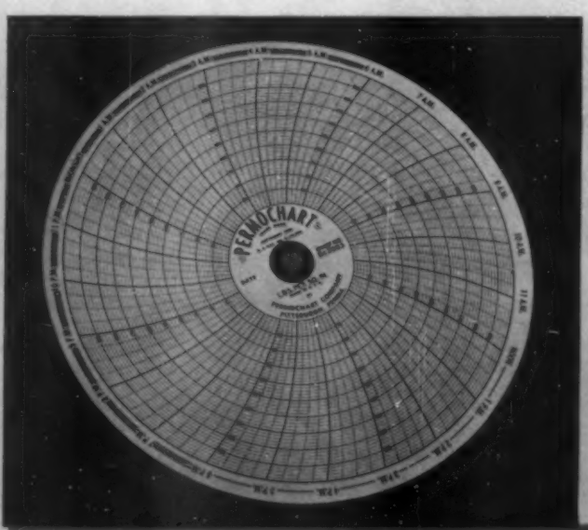
8 Plastics play an important part in the field of fluorescent lighting in providing sufficient light to prevent eyestrain and make use of strong light without inducing glare. These urea fluorescent tube sockets provide vital insulation where needed. Molded of Beetle, by Bryant Electric Company

9 Fastidious women will welcome the new cleansing tissue dispensers molded of Tenite. They come in a variety of soft pastel shades to match or blend with your bathroom accessories. Because they are virtually unbreakable, they are a good investment for all those who look for the unusual. Smooth, lustrous surface is easy to keep clean. Molded and manufactured by Plas-Tex Corporation

10 Smart cigaret case with a staggered arrangement of 20 individual compartments to hold a full pack has been introduced in methyl methacrylate. The construction makes possible a thinner full-pack case which fits a vest pocket. Center section is molded in one piece. In crystal-clear, sapphire, emerald, ruby, rose, and amber Lucite, injection molded by Worcester Moulded Plastics Co. for Mavco, Incorporated

11 A midget radio that nevertheless retains all the clarity and beautiful tone of the larger cabinets has appeared on the market in colorful cast resin. It is perfect for the bedroom or that extra room in the house where the family congregates. Manufactured of Catalin by the Espey Radio Company

12 What price glamour? It's not much of a question to women who use Glamour-Girl clear polystyrene curlers for these light weight aids to beauty are easy to handle and give results. They come in 3 sizes and are chemically resistant to most hair lotions. Molded by Columbia Protektosite Co. for Hayes-Donahue Mfg. Co., Inc. (*Please turn to page 40*)



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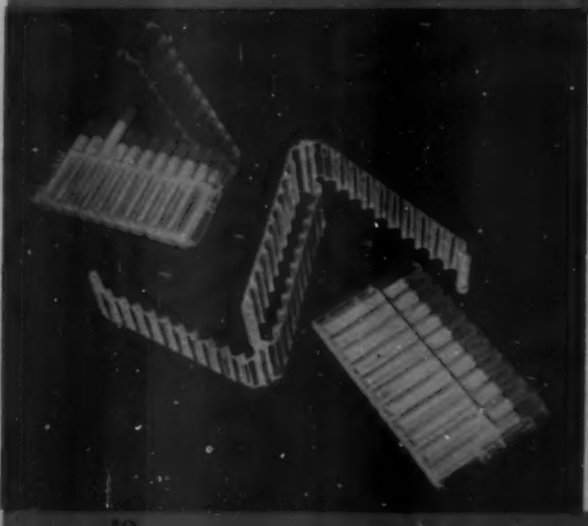

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Arc-proof limiter shells

by E. M. BEACH*

Cold molded plastic plays important role in safeguarding electrical distribution systems

MOST people know that their homes are safeguarded from fires caused by short circuits in the wiring system of the house by a fuse located generally somewhere in the basement, and which has to be replaced from time to time, whenever the lights go out or the vacuum cleaner ceases to function. They look through the isinglass window of the plug fuse which is screwed into the socket in the metal box downstairs. They know that inside of the plug fuse is a small bent wire which usually burns up when the fuse itself "blows."

So accustomed are we to this protection that one really has to stop and think what would happen if there were no fuses, no current interrupting devices at all between the electric generating station and the lamp by which you are reading this page.

But safeguarding your home with a fuse in the distribution box of your house is a simple matter compared with the problem of safe handling the enormous volume of electrical current generated and distributed by light power companies, from the generators, through electric cables under the streets and into the thousands of dwellings, stores, factories and all the other places where light and power are consumed. One of the devices recently developed and adopted by Consolidated Edison Co. of New York, Inc., to isolate a fault or short circuit in the network distribution system is a fusible element introduced at strategic points which acts in the same way as the fuse in your house acts, namely, blows out when, by reason of a short, the current flow becomes too great and would otherwise overheat the copper insulated cable. Only in this case the cable is as big as your thumb or even bigger whereas the wire leading to your house fuse is little larger than the lead in a pencil.

Naturally a differently designed fuse is necessary on such a large scale. This design in its simplest form consists of a copper tube flattened in the middle and then cut away in the center section to a nice degree which permits some overloading but fuses or burns open before any damage will result to the adjacent insulation on the cables which are installed with a compression connection in either end of the copper tube. Just as a house fuse is enclosed in insulating material, so is it necessary to surround the large cable fuse with an insulating material which will confine the electric arc when the fuse blows.

After exhaustive tests the engineers of the Consolidated Edison Co. selected an asbestos-filled cement binder compound for this purpose. Since it is made entirely of inert materials intense heat resulting from

* Vice President, Garfield Mfg. Co.

PHOTOS, COURTESY ELECTRIC WORLD

1—Discussed here is a limiter, a device with a reduced metallic cross section and suitable terminal facilities to permit its installation on secondary cables at multiple points. In order to withstand the conditions of the underground manholes, cold molded housings are used. The workman seen in photo is splicing limiters into cables on the power distribution system. The device prevents cable faults from spreading on networks

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PHOTOS, COURTESY GARFIELD MFG. CO.

an electric arc does not cause the cold molded plastic to give off any gases. At the same time, this material can be molded to exact shapes and tolerances for the purpose. It has sufficient toughness to resist the ordinary handling of the installation crews so that loss from breakage is practically nil.

Installations of fusible limiters are made in the manholes of the distribution network so that when a fault develops between cables not only will the fault be isolated, but the link or fuse will be readily accessible for replacement. Prior to the use of fusible limiters it was a frequent occurrence to lose hundreds of feet of cable whenever a fault developed in the line, and this necessitated costly and laborious cable replacement as well as interrupted service to customers in the affected area. Installations of limiter equipment have continued for the past three to four years starting with the more congested districts of the city until at present more than thirty percent of the electrical distribution system is so protected.

Molds for these applications are single cavity construction made of high grade tool steel and chromium plated to resist the abrasive effect of the asbestos filler used in the molding compound. The process is cold molding and as the pieces are all fairly large and pressed when the mix is damp, multiple cavity molds are not practical. Presses used are compression type equipped with hydraulic throw-outs and vary in tonnage capacity with the size of the piece to be produced. Ordinarily the pressure required is generally less than that needed for properly filling out molds used for other cold molded powders or composition.

In the preparation of the cold molding material mix, dry asbestos and cement are mixed together and sufficient water added to give the proper consistency for molding. Cement sets quickly (*Please turn to page 90*)

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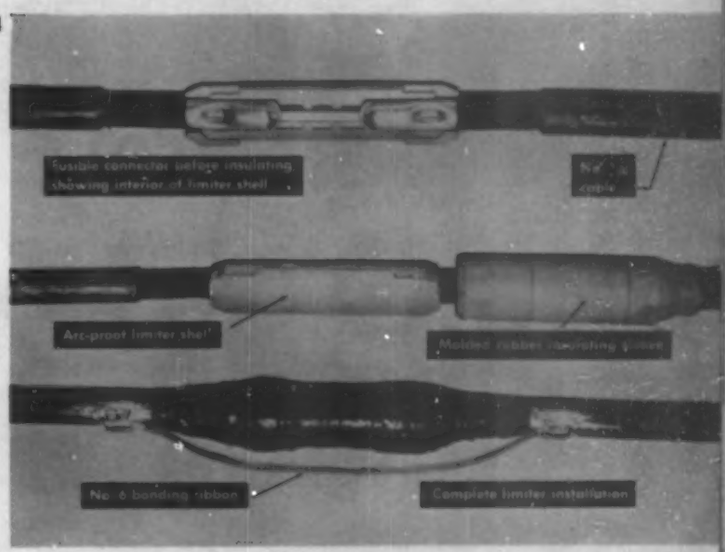
Fusible connector before insulating showing interior of limiter shell
Arc-proof limiter shell
No. 6 bonding ribbon
Complete limiter installation

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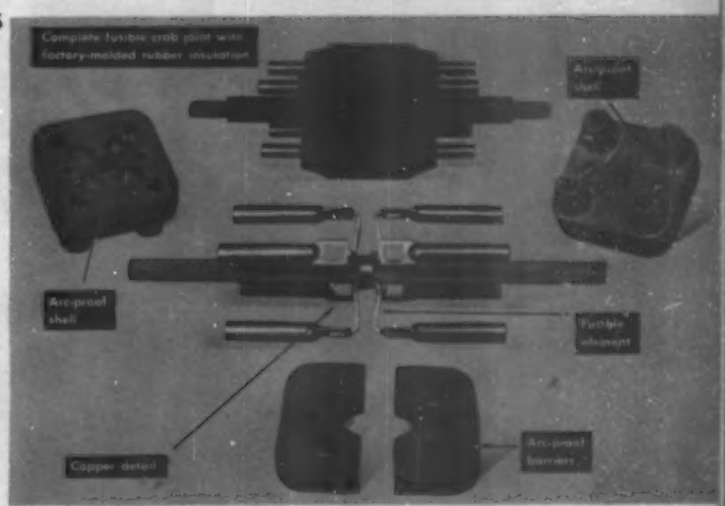


2—The workman in photo is pressing a wet bonded inorganic cold molded mass into shape preparatory to oven curing. 3—In this impressive array of ovens the limiters are cured under controlled heat and predetermined time conditions, both of which have an important effect on the finished pieces. 4–5—On existing networks the individual limiter is used in this manner, for lead-covered, rubber- or paper-insulated and non-leaded cables. Multiple unit or "crab joint" is used on secondary networks. Each is stuck in a fuse. On failure through short circuit, another is connected without disturbing cables

13 A full glass of vegetable or fruit juice is secured without any pressure in just a few seconds from this sturdy single automatic juicer. The lid is molded of ivory Bakelite urea, while the motor base housing is of walnut phenolic. Plastics were adopted because of their lightness, electrical insulation and resistance to food acids. Made by Jiffy Juicer Machines, Inc., and molded by Mamco Mfg. Company

14 Catalin scores as a desirable industrial material in its recent application as a gear. Approximately 2 in. in diameter, the gear is easily fabricated to exact tolerances. It was chosen for its qualities of strength and resistance to acids and oils, plus the important factor of silence of operation. Manufactured for Schirmer-Dornbirer Pump Company

15 Visible the full drawer length, plastic tab indexes are designed to save space and insure clarity. The convex lens magnifies the printed insert which slips inside each tab. It is claimed that 1 in. of space every thousand index cards is saved by designing the head portion so that it was entirely above the card level. Molded of Nixonite by Gits Molding Corp. for Barkley Plastic Tab Indexes. They are used for file folders also

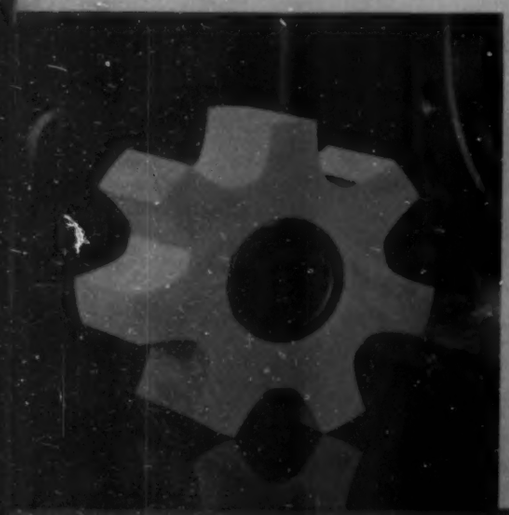
16 Presence of plastics becomes increasingly evident with each new cooking appliance. Two new electric ranges use Plaskon for the time dials and pilot jewel lights. The handles also make use of this material with an inlay of chromium. Calibrations on the timer dial are wiped with black. Molded by Peerless Plastics Molding Co. for Electromaster, Incorporated

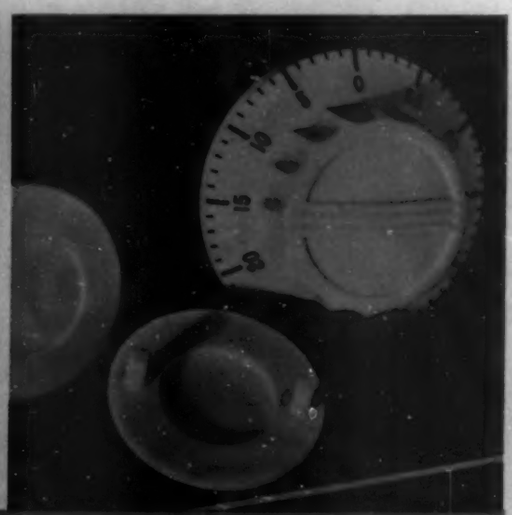
17 Molded-laminated Textolite replaces aluminum in an 8-in. pulley sheave used on G-E wire enamelling machines. Advantages over its predecessor are: light weight; it does not pick up coating from the wire, there is no sediment left in groove, and furthermore it does not become hot in operation, thus reducing the need for lubrication. Also has required dimensional stability and chemical resistance

18 Redesigned pocket dispenser for adhesive tape makes its bow in a two-piece friction holder of brown Durez. Metal cutting edge is also a friction fit. An angular S-shaped stamping, it is held in place by 3 lugs. It is reported that sales are running more than 200 percent over the old metal dispenser (left), although the plastic version (right) retails for a higher price. Molded by Waterbury Button Co. for Minnesota Mining and Mfg. Co., Barnes and Reinecke, designers

19 "Futur-Liners" may well be called the truck of tomorrow. They have borrowed bomber-type cockpits entirely enclosed in Plexiglas globes for the cab. These give the two-man truck crew perfect visibility, and are shatter- and weather-proof. Built for the General Motors' Parade of Progress Science Carnival fleet now touring America

20 This sprue shows transparent cellulose acetate butyrate belt buckles just as they come from the injection press. Franklin Plastic and Die Casting Co. mold these popular items of Tenite for Hickok. Buckles are lightweight, decorative and yet have the toughness and stability to serve their purpose





PLASTICS IN REVIEW

21 Diffusion problems in fluorescent lighting are simplified by light, one-piece polystyrene diffusers which snap into place, and are suspended directly from the tube. The material is basically clear-transparent. The pigmentation of the colors used in the shields is closely controlled to insure high light transmission with minimum glare. Molded of Lustron by St. Louis Plastic Moulding, Inc., shields sold in different tints for color correction of fluorescent light by Edwin F. Guth Company

22 A molded propeller type fan molded of Bakelite high-impact phenolic replaces metal for the new model Carrier weathermaker, chosen because of light weight, low initial cost, and simplified production. Quiet, the fan operating at 1200 rpm does not transmit electrical noises from motor to the air stream. Molder, Plastics Engineering Company

23 Light your way to safety with this new molded Beetle flashlight battery case. Strong, self-insulating, the case is quickly and easily assembled. Comes in ivory, red, blue, and black. Two batteries are sold on the initial purchase opening the way to refill business. Abutments and indentations are molded directly into the case. Special spring hinges and housings by Rathbun Molding Corp. for Burgess Battery Company

24 Fashions in sun glasses this season are large lenses with plastic rims, and, smarter yet, are removable lenses which can be snapped in and out of tinted plastic rims, to match and blend with various costumes. Vurite Removo-Lens Sun Glasses made from Nitron by Optical Products Corporation

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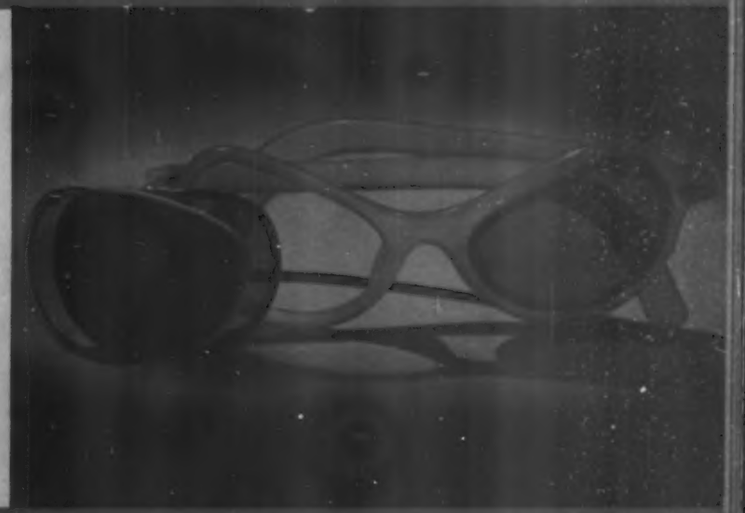

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What's in a vacuum?

by C. H. TAYLOR

Strength, appearance, and simpler assembly, achieved with molded plastics in new vacuum cleaners

DESPITE the caution with which engineers and designers approach the application of new materials to well-known design applications, the use of plastics for vacuum cleaners is a "natural."

The cleaners are designed to take full advantage of the properties of the plastics, as well as exacting the maximum efficiency from engineering and molding design. Westinghouse is now making two special vacuum cleaners using plastic parts. They are the cylinder type cleaner and the motor driven brush cleaner with a self-adjusting nozzle. They are made of low cost phenolic compounds, although it was not the consideration of cost alone that led to the choice of this material. Experimentation has proved that it is most suitable for good performance. First to consider is the proper material as the word plastic covers a large family of materials. Naturally, when material is mentioned, the cost in most cases is the most important factor. However, if the part is small, or if very thin walls can be used, the price of the basic material in the part is not an issue. For this reason such articles as knobs, buttons, or small nozzles used on attachments are often made of cellulose acetate or acetobutyrate. In such cases, it may be that the decorative value of the part is more important than the piece price. In general, however, low cost phenolic compounds are used whether the piece be large or small. They may be either woodflour-filled for parts which do not need impact strength, or the shock-resistant, cotton flock-filled for impact strength and rigidity. Very often the cotton flock material creates a mottled effect which is sometimes objectionable; to offset this effect, the cotton flock filling may be cut down in percentage to give practically as good a shock-resistant material in a nearly solid color. Although other materials may have been used on occasion, foregoing compounds have been and are being commonly selected by the vacuum cleaner designer.

* Engineer, Merchandising Div., Westinghouse Electric and Mfg. Co.

On the all-plastic hand vacuum cleaner, the material used is phenolic woodflour filled. The four parts, motor frame "A," motor bracket "B," fan chamber "C," and nozzle front "D," are shown on Fig. 2 in the manner in which they are assembled to make a complete encasement. The motor frame houses all parts of the motor and is also used as the outer case. This part is joined to the motor bracket which encloses the motor part and supports one motor bearing, and also contains the exhaust of the fan chamber which combines several parts. The motor bracket is joined to the fan chamber which houses the main fan of the cleaner. Walls on the outer parts of the fan chamber are approximately .375 to .500 in. thick in order to provide for impact strength against particles picked up by the cleaner. In front of the fan chamber is the nozzle inlet which is joined to the fan chamber completing the cleaner assembly. This nozzle inlet also has molded on it the bottom lip structures and mounting bosses for assembling the nozzle opening guard wires. All of the parts are joined together with self-tapping screws to insure vibrationless fastening and reinforcement of one part to its mating part.

Fig. 4 shows a phenolic cotton flock-filled plastic floor cleaner hood. This part has heavy front and rear sections, but is thin in the central section to provide springing in case of impact blows. The front part of the hood is provided with a rubber bumper which also serves as a decoration. This part has stood up unusually well in service, because heavy sections are provided for impact blows and thin sections permit flexing where blows cannot be expected. In this way the shock load is not transmitted from one end of the motor hood to the other.

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Small decorative drapery nozzles also are made of cellulose acetate. This material is ideal for an application of this sort as it allows for high impact blows together with resistance to bending and scratching.

After the material for the application is selected, another important thing is to design the parts so that they assemble easily. Two or three machining set-ups before assembly of each part would hardly be considered easy assembly. Generally, the assembly of the parts that are molded should be studied closely so that they will join each other on a single plane or diameter. Machining should be limited to not more than one or two set-up operations in order to prevent cracking of the parts before they are assembled in the unit as a whole.

In connection with the assembly of the parts the wall thicknesses are important. Proper thickness and position of these walls will provide a uniformity of strength when normal practical tolerances are to be held. It is better sometimes to keep the walls as thin as possible because the wall thickness can be increased by removing material from the side of the die or the outside of core if this is later desired. In this way, where strength is needed, plastic can be added without the use of any more material than is necessary. Part of the problem of wall thickness is the placing of inserts. In only rare cases are inserts necessary, and it is often better to reconsider the design before using them. If inserts seem unavoidable initially, it may be possible to eliminate them at a later date if sufficient material has been added so that the plastic itself will be strong enough. They are occasionally necessary to secure the strength required for attaching screws or some decorative parts. Many inserts are standard and can be secured from various sources with little expense. When it seems necessary to use inserts, it has frequently been found that a hole may be drilled and the insert then pressed into the hole instead of having the insert placed in the die and molded in place. Of course, this can't (*Please turn to page 84*)

1—The "Floor Cruiser" may be easily converted from a hand cleaner into a floor model useful light duty. **2**—Four molded woodflour-filled phenolic parts assemble into the all-plastic cleaner. **3**—Left to right: nozzle front, fan chamber, motor bracket and motor frame. All parts of the motor are housed in the frame which serves as the outer case. **4**—Cotton flock-filled phenolic gives added strength to the "Captain's" one-piece floor cleaner hood. Wall thickness tapers toward the middle to allow springing in case of heavy impact blows

Laminated Luxury

SURE fire formula for success in striking decor is to take a well-known decorator and a clever designer to dream up and execute an exciting method of using plastics. This is exactly what was done for the glamorous Coty Salon, recently opened with a spectacular press show in New York City.

The luxurious interior of the salon owes much of its distinction to the use of laminated urea sheets into which the design, painted on paper, has been incorporated. Large cabbage roses and a variety of dainty blossoms trail along a black background. Mother-of-pearl has been used in conjunction with the color, and the whole job finished in a glossy high polish which holds and reflects light. The two gigantic screens flank either side of a mirrored wall (above). They are 11 ft. 4 in. tall and 20½ in. wide. The process was also used on the display cases and counters. Glass shelves holding perfume bottles on the wall are outlined in a shadow-box made of the material and the counters themselves are outlined with it (left). The sides also make use of a solid sheet showing a cluster of roses.

Reasons for choosing this (*Please turn to page 96*)

Strictly American

A DRESS label, unobtrusive enough not to overshadow the merchandise and informative enough to satisfy the most demanding department store buyer and the Federal Trade Commission, has been designed by an American industrial designer for all Crown Rayons of the American Viscose Company.

Thin gage transparent sheet stock was chosen for the tag on which the metal crown, trade mark of the company, appears on two separate types of tags. One is $3\frac{1}{2}$ in. by 2 in., printed in silver on a very thin gage transparent sheet stock. Corners are rounded and a crown emblem of gold foil is pressed into the plastic about $\frac{1}{2}$ in. down from the top. Directly above this insignia, the tag is punched and strung through with a royal blue silken cord. The second tag is $3\frac{1}{4}$ in. by 2 in., made of a thicker gage material. It features a metal crown emblem at the top in red, white and blue. The patriotic colors are repeated in a loop of ribbon through the punched hole. The metal piece has a stem on the reverse side which is put through an opening punched in the acetate sheet. A metal disk with a threaded center opening screws on to the prong. The ribbon is sandwiched between this disk and the plastic.

Since it had been the experience of most manufacturers that buyers immediately tore off unattractive tags, the rayon manufacturer proceeded warily before deciding on the type of tag and material. A questionnaire was sent out to buyers in 5000 department stores throughout the country. Typical questions were:

What do you object to in labels?

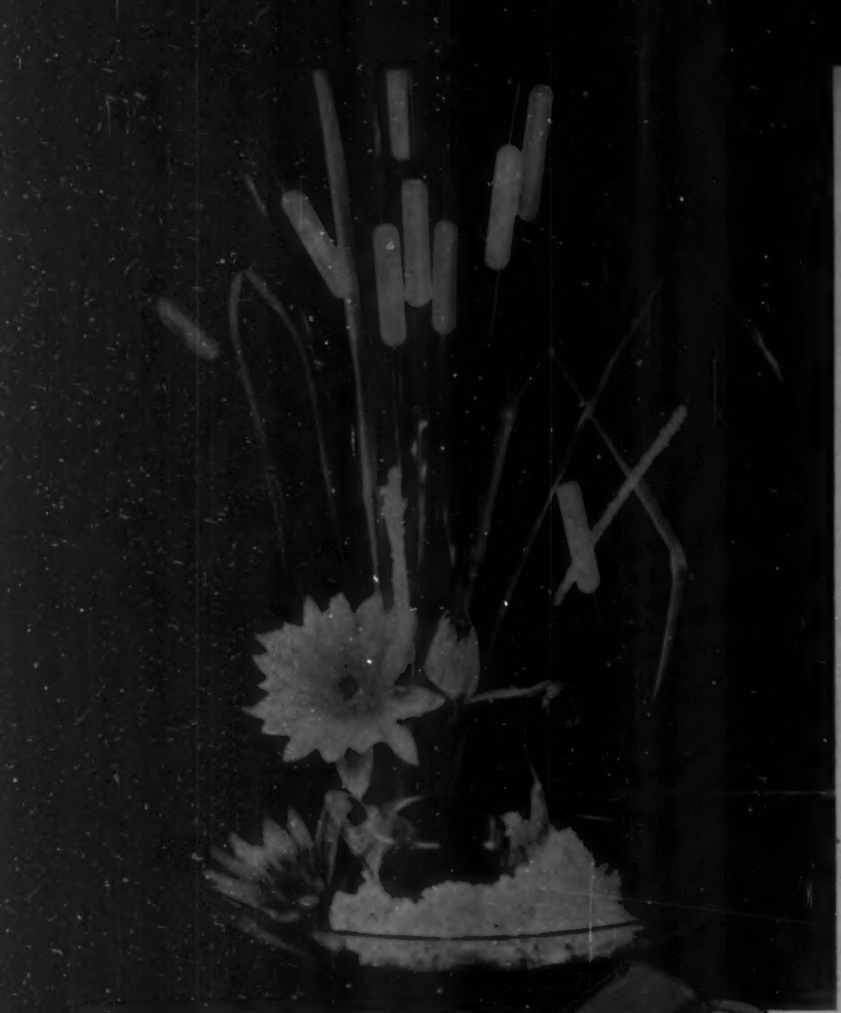
Why do you not leave them on the garmets?

What type of tag would you leave on garments?

Answers to the questions brought out information which was the basis for the company's choice of plastics. Department store buyers were generally agreed that they objected to the majority of tags on esthetic grounds. Colors usually clashed with merchandise which the tag identified. Size was another factor. Most tags were cumbersome. Furthermore, the sharp corners were objectionable because they often picked up threads of loosely woven fabric, damaging the merchandise. Buyers unanimously agreed that there was more manufacturer's information on the label than customer information. This last observation by buyers went hand-in-hand with the consumer movement toward more informative labeling and the Federal Trade ruling which specifies that all garments which contain rayon must be tagged with that information.

The two tags illustrated (right) show the use of these labels to identify both the designer and fabric. Both tags have already been widely used in the dress trade—particularly to emphasize American fashion styling.

Credits: Labels designed by Donald Desky for American Viscose Co. Transparent acetate sheeting by Celluloid Corp. and Dow Chemical Co. Fabricated by Robinson Tag and Label Co., Dennison Mfg. Co., and Whitney Mfg. Corporation.



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Decorative Accessories

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THE flow of plastics into the decorative accessories field is endless and always interesting. New designs, new uses for plastics are bound to catch the eye. Here we find another collection of some of the latest plastic accessories. 1—A sheaf of graceful cat-tails mingled with water lilies is carved of Lucite. Tops are sanded. Leaves and grass are fabricated of Lumarith and Celluloid. Designed by Raymond P. Perkins, Jr., for Podesta and Baldocchi. 2—Another flower arrangement, this time in a lovely basket woven of clear transparent Tenite, extruded by Detroit Macoid Corp. The basket is manufactured by Aladdin Fabric Co. 3—You can't play with these big fellows, but you can admire them for the perfect job they do of supporting your books. Made of green Catalin by Neo Designs. 4—Three sections of Bakelite cellulose acetate form the standard of a dainty vanity lamp. The design and color are applied by a patented process to the inside surfaces, and the clear transparency of the plastic lets them show through with a brilliant effect. Available in rose, blue and green shades, the lamp is 14 in. high. Plastic parts are molded by Gemloid Corp. for New York Merchandise Co., Inc. 5—This lamp is a column of light. It's Lumarith Clair de Lune designed and made by Hannah Porter, Inc. 6—A mammoth pitted pottery pear from Paul Hanson Co. with its glazed pottery leaves of bright green is topped by a blanche Lumarith shade trimmed with green and white crumpled silk. 7—Copied from an original glass bowl carved by Harriton Carved Glass Co. a lovely bowl with its classic lines and designs is cast of Marolin cellulose acetate in rubber molds by the Czecho Peasant Art Company. 8—Rope designs characterize the rim and legs of this smart coffee table, with silver flecked Lucite cigaret box and a hyacinth colored bowl made of Prystal, from Neo Designs. 9—Frosty bubbles in Plexiglas beautify a smart clock and candle holder, by Gustave Green of Plastic Age, Incorporated.

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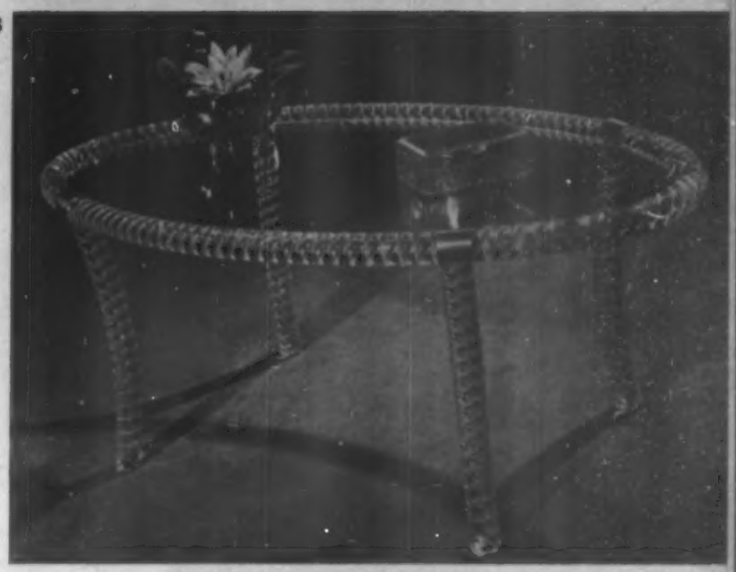

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Filing is frequently an important finishing operation in molding plastics. No file is universally suitable for all types—thermosetting and thermoplastic material requirements differ. Several of the various kinds of files used for finishing plastics are shown above

Filing molded parts*

FILES are widely used in the finishing of molded plastic parts and in many cases are the essential part of that process. They are used to remove the flash left by the molding operation, to clean out holes and slots and to smooth up any roughness left by the removal of excess material.

Compression molding is the oldest and still the most commonly used method of processing plastics. While through careful design and mold construction the amount of flash developed in molding is reduced to the minimum, some usually remains. This flash has to be filed off, frequently a hand operation. With injection molding, the piece has practically no flash to trim, except for the removal of the gate through which the material has entered the mold.

There are differences in the various types of molding plastics. The thermosetting phenolics and ureas are harder than most thermoplastic materials. The differences in their construction characteristics are noticed when the materials are filed.

Since phenolic materials consist of a wide variety of compounds, ranging from the standard all-purpose woodflour base to canvas and asbestos filled types, their filing characteristics vary accordingly. Along with urea materials, the phenolics account for a substantial part of the molded plastics. When these plastics are filed the material is removed in powder or dust form and what does collect in the teeth can generally be removed by brushing the file or by rapping it on the bench or on a wood block.

All plastics in general have an abrasive action on files, as they have on other cutting tools, and while ordinary files in many cases will give satisfactory results files which are made especially for use on plastics will give better. In ordering files for this use the type and nature of the plastic on which they are to be used should be given so that the file manufacturer will know the requirements of the job and furnish the best file.

Plastics require sharp cutting tools. Very sharp, keen, thin topped teeth are required which will retain their sharpness as long as (*Please turn to page 86*)

* This article was prepared by the Research Department, Nicholson File Co.

New light on an old problem

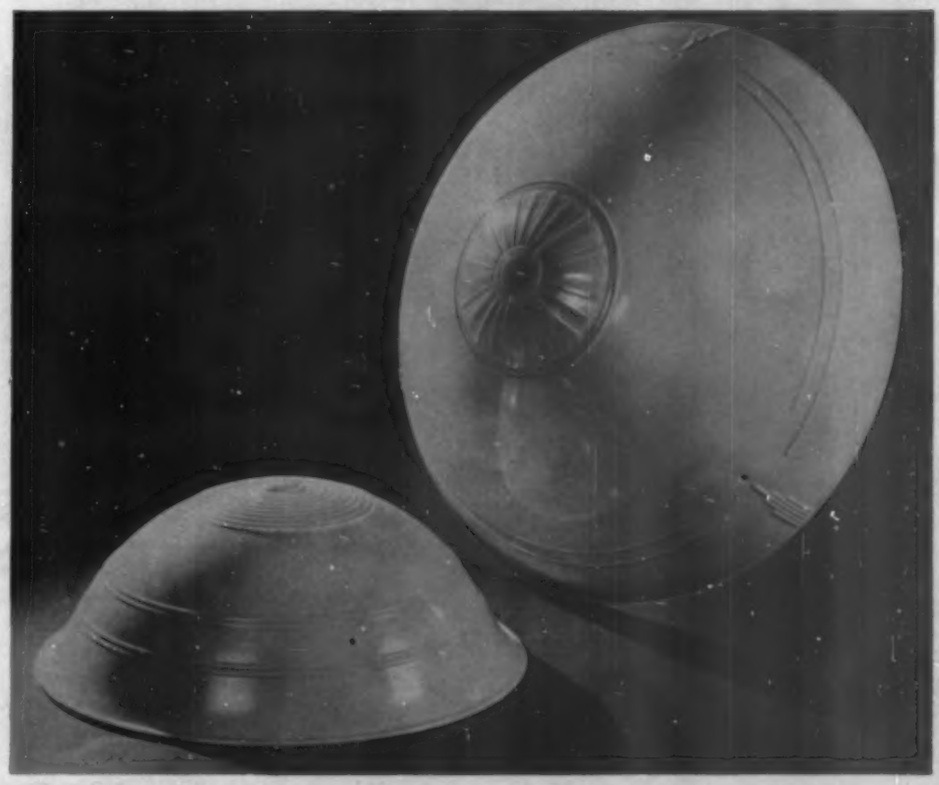
Translucent molded urea reflectors are used in ceiling and lamp fixtures for low rent housing projects

COZY little rooms are now flooded with soft, bright lights that come from molded plastic lighting reflectors in the 3 low-rent slum-clearance housing projects in New Haven, Conn., giving eye comfort to thousands of families who never knew correct illumination.

The New Haven projects which were authorized under provisions of the United States Housing Authority Act of 1937, made available $5,500,000 as a loan to the city from the $800,000,000 set aside for housing projects throughout the country. Good lighting, both daylight and artificial, was one of the primary considerations in planning the units for the health and well-being of occupants of these multiple dwellings.

P. E. Nelbach, technical director of the Housing Authority of the City of New Haven and a member of the Hygiene of Housing of the American Public Health Association, who is closely allied with the projects, names the three essentials for good housing as good lighting, thermal comfort (heat and ventilation) and sound control. In discussing the slum clearance projects, he stated:

"Unless these health essentials are provided, many families will suffer. In the case of lighting in particular, these families have neither the knowledge nor the margin of purchasing power to provide efficient well-planned lighting for themselves." (*Please turn to page 92*)



Above—Typical living room in one of New Haven's low-rent housing projects furnished with translucent molded urea bowl on the ceiling fixture. This reflects soft, glare-free light. Right—Close-up of two of the reflectors that solve the lighting problem for these multiple dwellings

Liquid battery case

The Wheat rechargeable battery, a light, compact hearing aid, has been perfected by the judicious use of plastics today. It gives the user the benefit of a liquid type battery without danger of spilling or excess weight. This is made possible by having the case completely molded of transparent polystyrene, unaffected by strong acids and with a high insulation value. It is a 2-cell, lead acid, four volt battery. The case consists of 7 intricately molded parts. They are battery jar, jar top, top cover, 2 non-spilling devices and 2 filler plugs. Extremely close tolerances had to be held throughout so that there would be no leakage after the parts were assembled. All parts are molded of polystyrene, which not only has a high resistance to acids and alkalies, but also a high dielectric strength and unusual insulating properties. Having a specific gravity of about 1.06, the molded parts are very light in weight which was absolutely essential in this application. With the exception of the jar top, which is either black or green, all parts are transparent. This enables the user to see at a glance when the battery needs to be refilled—a great boon to the hard of hearing.

Credits: Lustron molded by American Insulator Corp. for Koehler Mfg. Company

P R O D U C T

Floor plug outlet

A literally down to the ground "before and after" story is a floor outlet redesigned in cellulose acetate at a substantial cut in costs. In the photo, shown at the right, is the original floor outlet which was made of brass. To the left of it is the plastic unit which has immeasurably improved the appearance of the outlet and made the problem of repair and maintenance simple. As formerly produced, the outlet consisted of 4 sand cast brass parts, each of which had to be machined and polished for assembly. The brass castings then had to be fitted closely around the outlet. It was $4^{3}/_{4}$ in. high, cumbersome, poorly balanced as compared to the new streamlined unit, and expensive and time consuming to manufacture. The new outlet, only $3^{1}/_{4}$ in. high, consists of a rough zinc die casting made in 3 parts and covered with a thin coating of molded cellulose acetate. The material is non-corrosive, self-insulating, rugged and durable, and has a permanently smooth finish, easily cleaned. Assembly is simple. A hollow molded top piece fits snugly over against the large molded base and is fastened by two tiny screws, easily accessible for repair work. The electrical unit slips inside and there is a double outlet.

Credits: Tenite, molded by American Insulator Corp. for Fibre Conduit Co. Designer, Gilbert Rohde

DEVELOPMENT

Electric iron handle

Conspiring to make the housewives' lot a happy one, a molded phenolic handle has been designed that will not burn the fingers and is so constructed that it allows the user to place the iron on its stand without lifting any weight. Aptly called "Never-Lift," the iron has a headlight socket, reflector and wiring molded as an integral part of the handle. A 9-in. chromium-plated cord support rod has a phenolic molded open ring cemented on to the rod through which the cord passes. The support, is easily removed and swivels at the base. In addition, the iron is equipped for use with a steam attachment. For such use an adjustable thermostat is set which connects a small portable steam generator that clamps to the ironing board to the steam inlet by a length of rubber hose. The steam generator has a high temperature cap molded of phenolic, which fastens on to the top with a quarter turn. The plastic top is quite an interesting molding. It is 2.5 in. in diameter, contains a molded-in safety valve seat, and a two-way outlet valve so that the steam may be directed out through an escapement hole or through an outlet into a rubber hose that connects to the iron. This guards against any possible burns from escaping steam.

Credits: Bakelite phenolic molded by General Industries Co. for Proctor Electric Company

Acid pump impeller

Higher pumping efficiency, longer life and lighter weight are insured for the Olivete acid-resisting centrifugal pump with a new impeller of a high tensile plastic. The impeller is molded of an acid-resistant phenol material with high chemical resistance and high impact strength. It measures $10^1/_2$ in. overall diameter and consists of a resilient sleeve, split gland and lantern ring. The plastic replaces rubber-covered machined bronze castings, which were expensive and comparatively short-lived. The weight was excessively high with this type of production and balancing afterwards was essential. Production cost is low—the new impellers do not have to be machined at all, with the exception of a reaming operation on a center insert in the hub. Balancing has been entirely eliminated and the efficiency of the entire pump has been increased due to the better surface of the impeller. It is estimated that there has been a 20 to 25 percent increase in efficiency and up to 5 percent increase in discharge head. With a decrease of about 50 percent in impeller weight the overhang load is likewise decreased. There is less torque on the shaft and stuffing box life has been increased. A section of the pump is at right.

Credits: Durez phenolic molded by American Molding Co., for Oliver United Filters, Incorporated

Midget electric tool

Molded plastics house the "Precise 35," an efficient, light, handy speed tool. It is 11 1/2 in. long, 2 1/4 in. in diameter and weighs only 35 oz. Encased in a shock-proof welded housing, it is equipped with a universal motor that develops approximately 1/7 hp. at speeds of from 35,000 to 20,000 rpm, under load. The sturdy plastic housing eliminates danger of shock from current leakage (U. S. patent pending) without the necessity of a ground wire. The housing is composed of 4 parts which can be taken apart and reassembled quickly, with no screws to loosen or fall out. Two of the main parts shown in the lower photo, the motor housing and cover, are assembled by a press fit; 2 parts pressed together to form a union without the use of screws or rivets. This not only requires that the pieces be held to close tolerances, but also demands dimensional consistency to assure the proper joint. The motor housing is also threaded at the other end to receive the spindle cover shown in the photograph, and has 2 side openings to receive bushings. The openings are molded, not machined into the part. The one-piece spindle cover has 4 distinct sets of threads, 3 sets on the inside, 1 on the outside of the part, all molded in one operation.

Credits: Bakelite housing molded by Chicago Molded Products Co. for Precise Products Corporation

PRODUCT

Transparent clock

"Le Baton," a clock of great elegance and precision, injection molded of methyl methacrylate to one inch thickness, has made its appearance at better jewelers and department stores. It is unusual by virtue of the fact that even with its exceptional thickness there is not one bubble, scratch or flow mark of any kind to mar its crystal beauty. This was made possible, according to the molders, by a new process in which the mold is kept at a certain temperature throughout and a careful check kept on the flow. Since compression molding took one-quarter to one-half an hour longer than injection molding, six clocks now are turned out within an hour's time by injection. There are 3 models: a long square 5 in. high, 7 in. wide and 1/2 in. deep; a smaller square (see photo) 4 3/4 in. sq. and 1 1/2 in. deep and a round clock 4 3/4 in. in diameter and 1 1/2 in. deep. Colors are clear crystal, or jewel tones of ruby, sapphire, topaz and emerald. The clock takes its name from the baton-shaped movement which is arranged with all the wheels in line and every part visible. It is a 16-jewel Swiss movement of exceptional quality which runs for 8 days. The spiral itself is metal and the dial 25 K. gold with numerals done in enamel.

Credits: Lucite molded by Boonton for Le Coultre Clocks. Designer, Jacques H. G. Monod

Palm-sized razor

Compact and light, the attractive new Ender speed razor is fabricated of brightly colored cast resin, shaped to fit the hand. The handle is made from a profile casting—a solid block of material cast in a lead mold to the approximate shape of the piece desired. It is then sliced by a cutting machine to the exact size and smoothed and polished. A bar is then cut down the center of the cast resin piece about $^{1}/_{32}$ in. deep. Two holes are tapped to accommodate 2 burrs projecting from the narrow metal strip in which the decorative trade name inlay is inscribed along the handle. The metal strip is inserted after the cast resin has been softened by heat. As the cast resin cools, it shrinks around the metal, thus permanently setting and holding the metal in place. The razor head is inserted in the same way. To fasten the razor onto the handle, one hole is drilled in the top of the plastic handle. The razor itself has a metal burr which is inserted in the softened plastic and frozen in place. Assembly and fabrication costs are reduced to a minimum. Important in these pressing times, the amount of metal used is negligible, about half the usual content of applications of this type. It can be purchased in 4 colors.

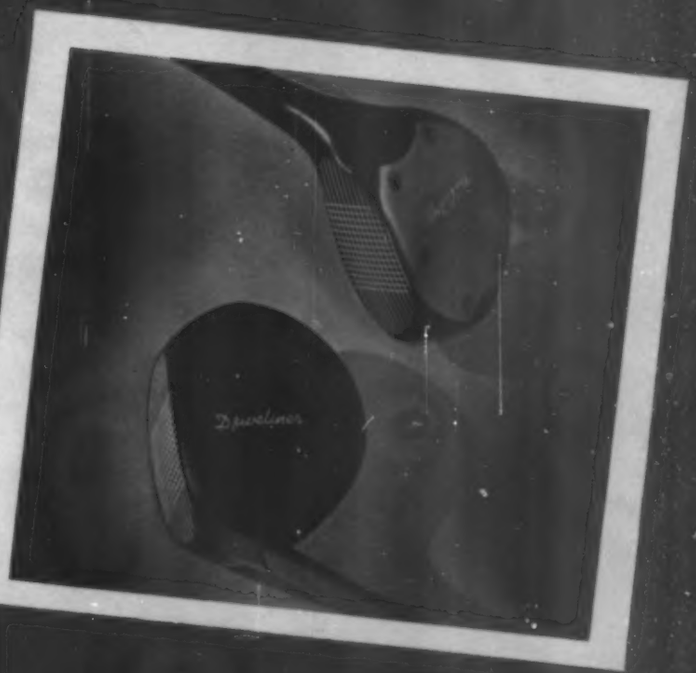
Credits: Catalin fabricated by Plastic Turning Co. for Durham-Duplex Company

DEVELOPMENT

Golf club heads

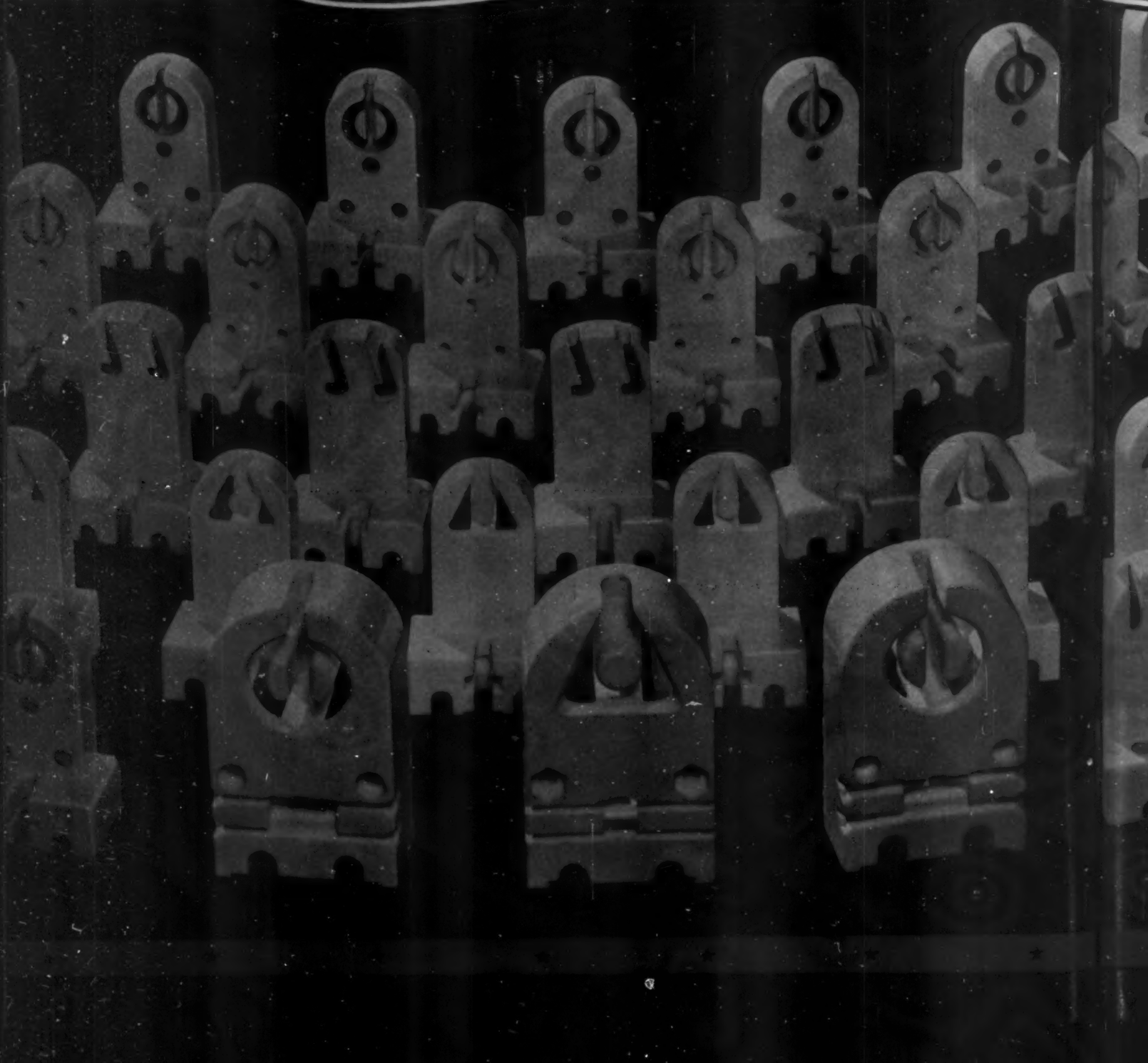
After several years of careful experimentation, the molded phenolic-headed golf club makes its appearance in the sports world. It combines all the qualities of the wooden club plus several features which may outmode it. At present only the driver is being manufactured, but engineers are working on dies for the brassie and spoon. At the end of the year it is expected that these clubs will be sold in sets of three. The driving face of the club is said to be scientifically designed to get a long straight drive. Weights are attached to either the sole plate or to the inside of the club head. In this way it is easy to get any weight or balance desired by merely adding, subtracting or shifting weights. It can be seen from the photo that the head is molded with a short neck and the balance of the neck is molded in a separate part. The other part of the neck may later be molded on another material to permit color combinations and eliminate the usual neck wrappings familiar to wooden head clubs. At present appearance of the club is conventional because it has been found that the golf enthusiast does not take to radical changes. The head is molded in steel dies with no shaping or carving necessary, and it will not chip, dent, crack or split.

Credits: Bakelite phenolic. Designed by Richard Fry for Hubbard-Fry Company.



IN AMERICA'S EMERGENCY

Fluorescent Lighting



Leads the Way!

FLUORESCENT lighting units are promoting high standards of efficiency for night and day operations, in at least 90 per cent of all newly-constructed defense production plants!

And in thousands of existing plants, now working night and day, newly-installed fluorescent units are aiding 24-hour-a-day precision work without excessively increased power load!

Our defense industries particularly are benefited by the modern miracle of fluorescent lighting. Workers become less fatigued under this glareless illumination, because it is free from harsh shadows. Errors are minimized; work goes faster; employer-employee relations are improved; health and safety are advanced.

All this is highly important in these days of emphasis on man hours, the key to speedy National Defense.

Molded Plaskon "tombstone" tube sockets (illustrated at left) meet three important needs in fluorescent lighting: (1) Their mechanical strength is essential for holding the fluorescent tube firmly in place, (2) they possess excellent dielectric properties so necessary for the high voltages used, and, (3) their unobtrusive neutral white color does not affect lighting efficiency or lamp appearance.

Plaskon has wide and varied applications in today's manufacturing schedules, and occupies a major role in the release of metals and other materials so essential for the Defense Program in which our nation now is so urgently engaged. Plaskon Company, Incorporated, 2121 Sylvan Avenue, Toledo, Ohio. Canadian Agent: Canadian Industries, Limited, Montreal, P. Q.

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PLASKON

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Decorative handles, knobs and drawer pulls suitable for stoves, doors, furniture, and miscellaneous purposes are available from stock molds without mold cost. Address Stock Mold Department, Modern Plastics, Chanin Building, New York, for manufacturers' names and addresses

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1289. Hollow tilted door handle, 11 1/2 in. overall length; 1/2 in. high. Hollow ends, each 3/4 in. Mounting hole centers in base 1/4 in. apart; 1/8 in. wide

1290. Hollow tilted door handle, 5 3/8 in. overall length; 1 1/8 in. high. Hollow ends each 1 1/2 in. Mounting hole centers in base 2 7/8 in. apart. Metal strip insert 1/8 in. wide

1291. Handle or drawer pull, 5 1/2 in. overall length, 4 7/8 in. center to center of bolts; 1 1/4 in. high. Threaded 1/2 in. bolts molded in

1292. Hemispherical, hollow, furniture handle, 2 7/8 in. overall length; 15/16 in. high; 3/16 in. threaded mounting center at base. Molded-in decorative finger grip at center

1293. Furniture handle same as 1292, in brown walnut

1303. Hollow knob 23/32 in. long; 13/16 in. wide; 1 1/8 in. overall height; 1/8 in. indented panel through center; shank diameter 3/4 in.; molded threads

1304. Knob 1 1/4 in. long; 23/32 in. wide through center; 23/32 in. shank; diameter of shank base 19/32 in. Wiped-in white trim

1305. Hollow handle 9 5/16 in. long; length of ends 2 9/32 in.; four molded bosses and threaded brass insert in each end; 5 1/8 in. between mounting centers in base. 1/8 in. metal strip insert on top

1306. Handle 3 7/32 in. long; 23/32 in. wide through center; with 1/4–20 threads tapped in each end. Mounting centers 2 3/4 in. apart

1307. Lift handle, hollow, 2 23/32 in. long; 9/16 in. center portion solid with plain 1/8 in. opening for inserting drive screw

1308. Pendant handle, overall length 2 3/4 in.; length of molded portion 2 1/2 in.; hollow interior with threaded metal projection

1309. Gas cock handle, diameter 1 7/8 in.; center area 5/8 in. at highest point; with D-shaped hole which can be turned so that the flat can be placed in four locations. Metal strip insert 1/8 in. wide

All molders are invited to send samples from stock molds to appear here as space permits

Reprints of all stock mold pages published to date are available to Stock Mold Service subscribers.

Evaluation of resinous flow

Measurement of the plasticity of thermosetting resins by the parallel plate method[1]

by F. J. BIONDI[2] and L. T. WORK[3]

THE ability of organic plastics to flow under pressure and be given permanent shape is the property of this class of materials on which their usefulness depends. The measurement of this ability, commonly referred to as plasticity, usually involves some combination of these variables of time, pressure, temperature and extent of flow. Three of the variables are ordinarily maintained constant and the fourth variable used as the measurement.

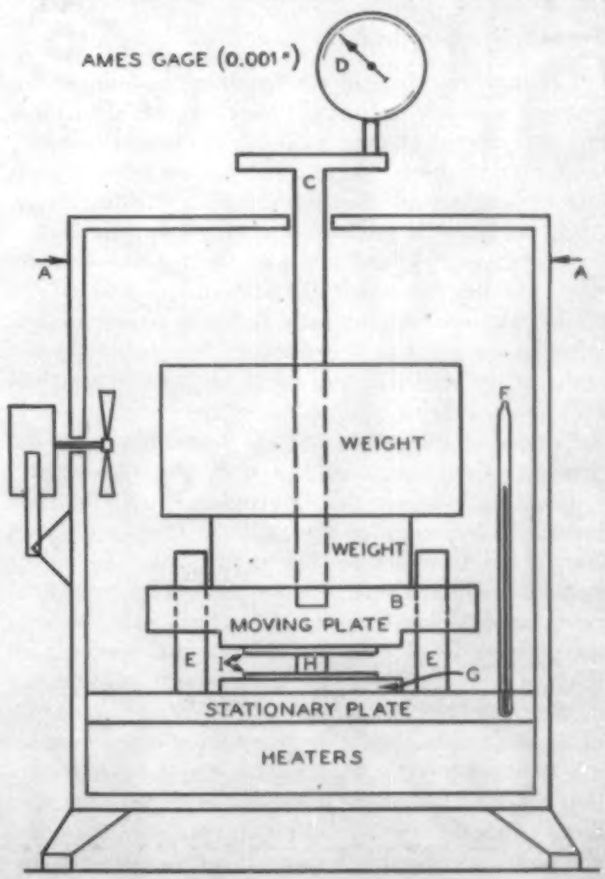
Compression of a test pellet, at either a constant or variable temperature, between parallel plates is one of the simplest and best known of these methods. The method was used by Williams[4] to study the plasticity of rubber and by McLean, Peek and Schumacher[5] to study the flow of wiping solders. The purpose of this investigation was to test the parallel plate method as a means of measuring the molding characteristics of the phenol-formaldehyde type of thermosetting plastics. The method of plotting the velocity of flow versus the height described by Peek,[6,7] and referred to by others,[8,9] has been extended to include three regions instead of one. The additional parameters reveal an interesting and useful method to evaluate the changing flow characteristics throughout the entire range of flow. The experiments described illustrate the ability of the method to measure the change in flow rates due to singly varying six factors and thus demonstrate not only its use as a research tool but as a control and specification method.

Apparatus and testing technique

The apparatus is shown schematically at the right. The weighted movable plate, *B*, whose upper extension, *C*, actuates the Ames gage, *D*, moves freely guided by three accurately machined and located guide posts, *E*. The temperature of the oven (*A*) for all the tests was 150 deg. C. ± 1 deg. C. and the pellets were at room temperature when placed between the plates (*B* and *G*). The movable deforming load was 36 lbs. Under these conditions the pellet acquired heat, but the mass of metal present was sufficient to prevent a change in plate temperature during the test.

Pellets $^3/_8$ in. in diameter and $^3/_8$ in. high (weighing approximately 0.5 gm.) were formed in a small steel mold under controlled conditions. The pellets were then trimmed to a chosen standard height and conditioned in an atmosphere of definite humidity. To make the measurement, the pellet *H* was placed between the parallel plates and time-height data were recorded. To prevent fouling of the plate surfaces, each pellet was

Schematic diagram of the plastometer, testing apparatus used in the parallel plate method of measuring the plasticity and flow of thermosetting resins, illustrates this technique



[1] Thesis submitted in partial fulfillment of the requirements for the degree of M.S. in Ch.E. at Columbia University. Published with the permission of Bell Telephone Laboratories, Inc.
[2] Member of Technical Staff, Bell Telephone Laboratories, Inc., N. Y. C.
[3] Director of Research and Development, Metal and Thermit Corp., N. Y. C.
[4] Williams, I., Ind. and Eng. Chem. *16*, 364, 1924.
[5] McLean, Peek and Schumacher, "Some Physical Properties of Wiping Solders," Bell System Monograph, B641.
[6] Peek, "Parallel Plate Plastometry" Bell System Monograph, B692.
[7] Peek, Journal of Rheology, July 1932.
[8] Bender, Wakefield and Riley, A. S. T. M. Consistency Symposium, June 1937.
[9] Houwink, "Physikalische Eigenschaften und Feinbau von Natur- und Kunstharzen."

placed between thin aluminum sheets (*I*, *I*) before insertion into the test apparatus. A supply of sheets was kept in the oven and a fresh pair used for each pellet.

Description of the powders tested

The molding powders used in these tests were compounds of phenol-formaldehyde resin and cellulosic fillers. The resin binder is precondensed to the extent that it is still soluble in acetone and is still thermoplastic. The resin is then incorporated with the fillers, dye, and the hardening agent by a hot differential milling operation. The milled mixture is pulverized and after proper conditioning is ready for molding. During or immediately after the molding flow occurs, the curing agent (hexamethylenetetramine) decomposes, supplying the necessary methylene cross links to form rigid, insoluble, infusible, three dimensional macromolecules.

The properties of the polycondensate depend largely on the structure, size and shape of these three dimensional macromolecules. The final appearance of the molded product, its homogeneity, resistance to stress, and electrical properties, will greatly depend on the ability of the resin binder to permit sufficient flow so that the powder completely fills the mold before final cure occurs. If the resin is too far advanced in the milling operation, curing may occur before the mold is completely closed. If the resin is not sufficiently advanced, however, the mold will close and must remain closed for some time to allow the resin to completely cure. Either procedure is undesirable and uneconomical.

Factors involved in flow

The flow occurring in the molding operation is dependent on many factors, the effect of each of which is not always evident because the final observable result is an integrated one, and also because the effect of each factor changes continuously during the molding cycle. After the pellet is introduced into the apparatus, the force of pressure initiates flow and a drop in height occurs. At the same time the still thermoplastic resin binder warms and progressively becomes less viscous allowing the pellet to flow further. The change in viscosity of the binder in turn varies with the quantity of heat which is being absorbed from the surface towards the center of the pellet, and the heat absorbed is dependent on the time of contact with the heat source.

The drop in height due to pressure is initially great but diminishes since the plate contact area for the constant force increases as flow occurs. As the curing agent decomposes and supplies methylene cross linkages, the changing viscosity of the resin switches from a decreasing trend to an increasing trend, causing a resistance to flow. The increase in viscosity is dependent on the rate of heat transfer and on the cross linking rate of the molecules. The enlarging area of contact causes a better heat transfer, thus augmenting the curing reaction which produces the molecular aggregates resisting flow. Although the area of contact between the pellet and plates is increasing, no motion occurs along the surfaces of the plates. Therefore, since no sliding friction is involved the flow is relatively independent of the nature of the plate surfaces.

Because of the inhomogeneity of the mixture and the formation of rigid macromolecules, the flowing mass cannot be regarded as a viscous medium, and the varying pressures are rarely static. Interlocking of particles and non-uniform curing cause areas to exist where extremely high pressures are effective and corresponding areas where little pressure is being exerted.

Accompanying the decomposition of the hexamethylenetetramine to supply cross linkages is the liberation of gases (ammonia, formaldehyde). These gases, in conjunction with the vaporization of both the water formed by chemical condensation and that ordinarily absorbed in the cellulosic fillers, greatly affect the heat transfer in the pellets. Excessive moisture may even act as a mechanical lubricant.

The molecular ratios and purity of the reactants and the conditions under which they are condensed affect the resin produced. Subsequent compounding of the resin to form a molding powder involves a multiple of physical and chemical changes which decidedly affect the moldability of the powder.

Even after the compounding operations, several variables which affect moldability will manifest themselves. The amount of moisture absorbed by the powder during storage will greatly affect the flow. The possible variability of mold charging or the use of pelleting and preheating will be reflected by a change in the flow. In the molding operation, such factors as temperature, pressure, and their distribution, time of mold closing, degree of flow, type of mold, character and cleanliness of the mold walls will affect the flow.

Interpretation of data

The data obtained by the parallel plate technique are plotted in the subsequent plots marked (a) in Figs. 1 to 6. By drawing tangents and computing their slopes, values of dh/dt or velocities of flow can be obtained corresponding to various heights, h. As reported by Peek,[6] when the pellet height/width ratio is small, the relation between the flow velocity and the height is represented by equation (1):

$$\frac{dh}{dt} = kh^n \qquad (1)$$

where k is a constant dependent on the volume under test and n is a constant characterizing the type of flow. This flow region is denoted in the subsequent plots as phase C and is the region in which curing occurs and a deceleration of flow is experienced. The values of n in this region are listed in Table I. A more complete picture of the flow undergone is obtained, however, by plotting log dh/dt vs. log h throughout the entire range of pellet height/width ratios from the initial height where the ratio is nearly one, to the final infusible state where the ratio is approximately 0.05.

Plots of log dh/dt vs. log h for the entire flow are found in the (b) figures (see Fig. 1b for phase designa-

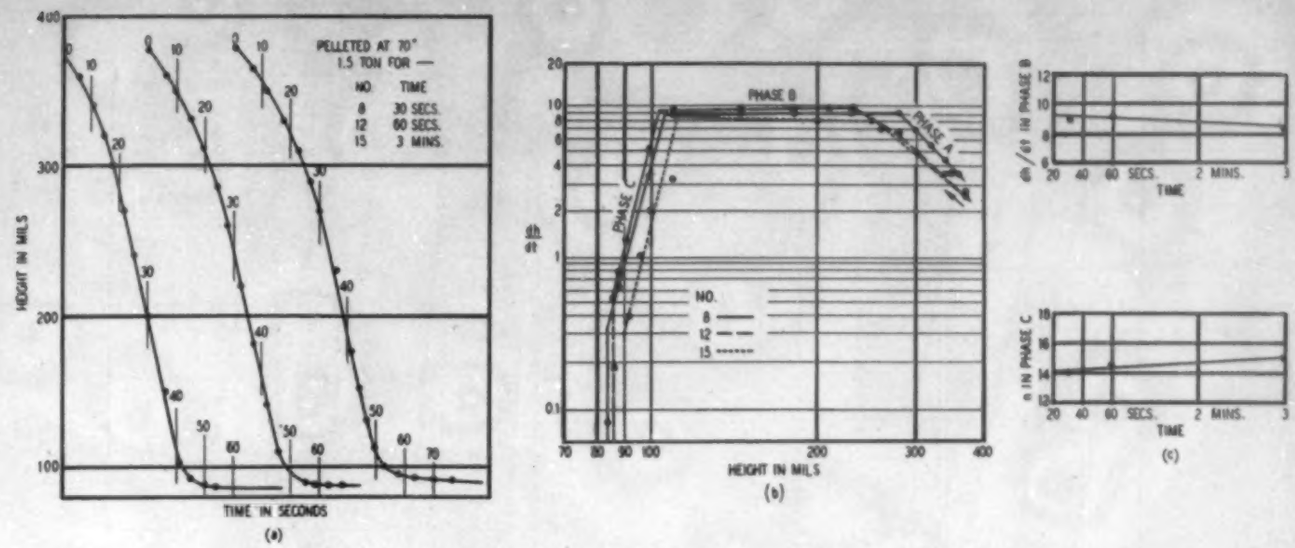


Fig. 1—Effect of pelleting time on flow

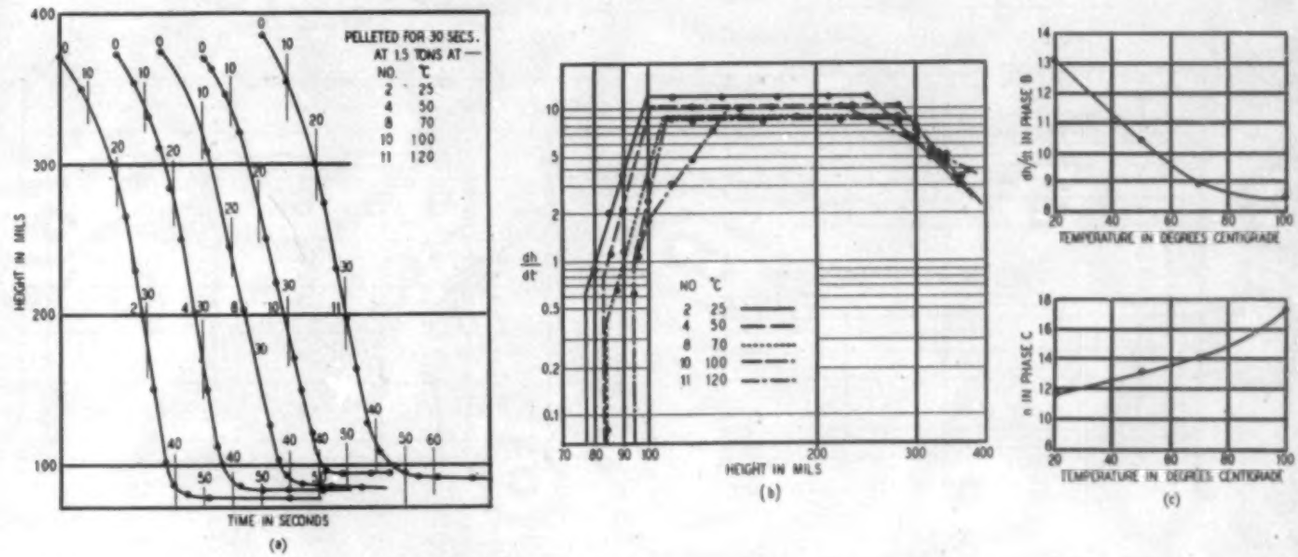


Fig. 2—Effect of pelleting temperature on flow

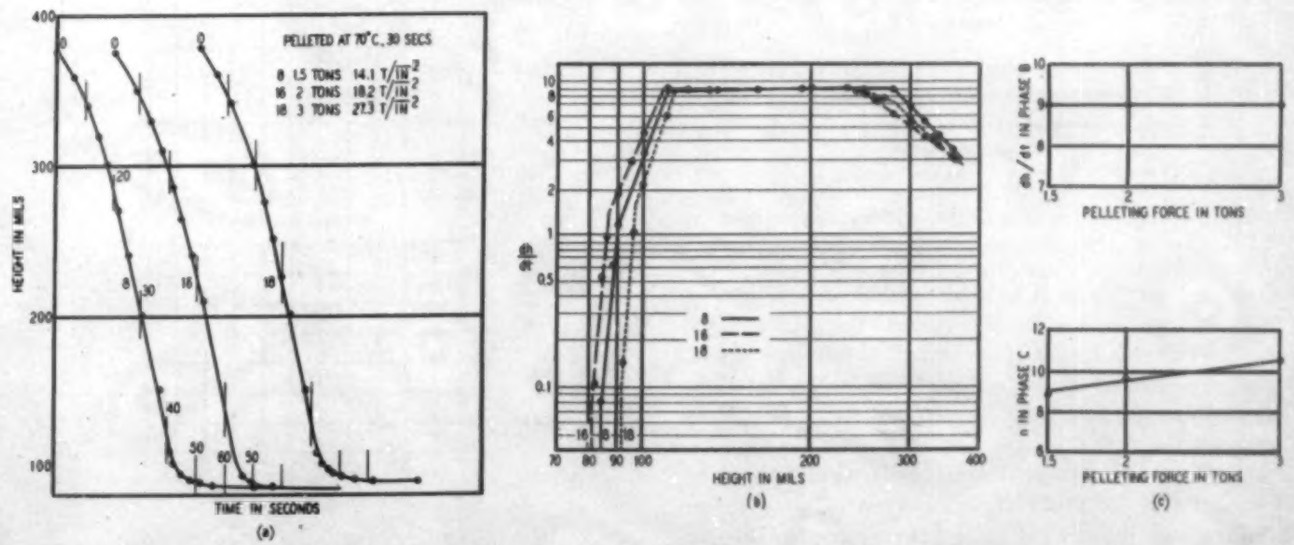


Fig. 3—Effect of pelleting pressure on flow

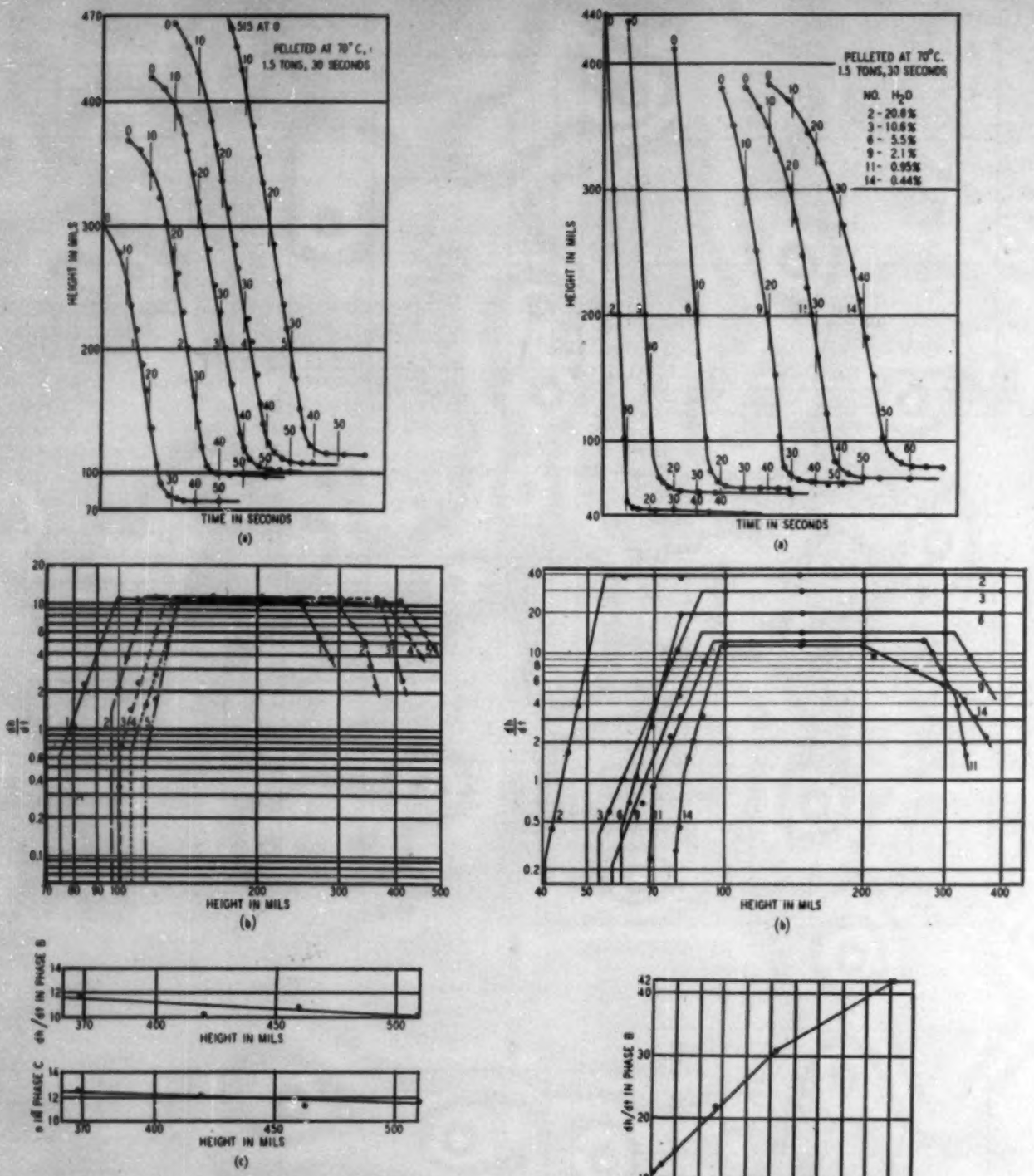


Fig. 4—Effect of various height-width ratios on flow

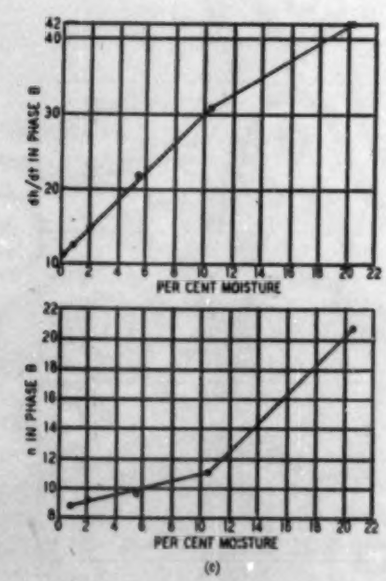


Fig. 5—Effect of moisture on flow

tions). From these it is evident that the flow takes place in three rather distinct phases, the slopes of the log velocity–log height plots being the accelerations in flow experienced in each stage thus supplying three parameters for analysis instead of one. The three phases are:

(1) Phase A wherein the resin softens and the compound begins to flow. The influence of temperature and pressure become sufficient to overcome the internal forces which tend to resist deformation. In this phase

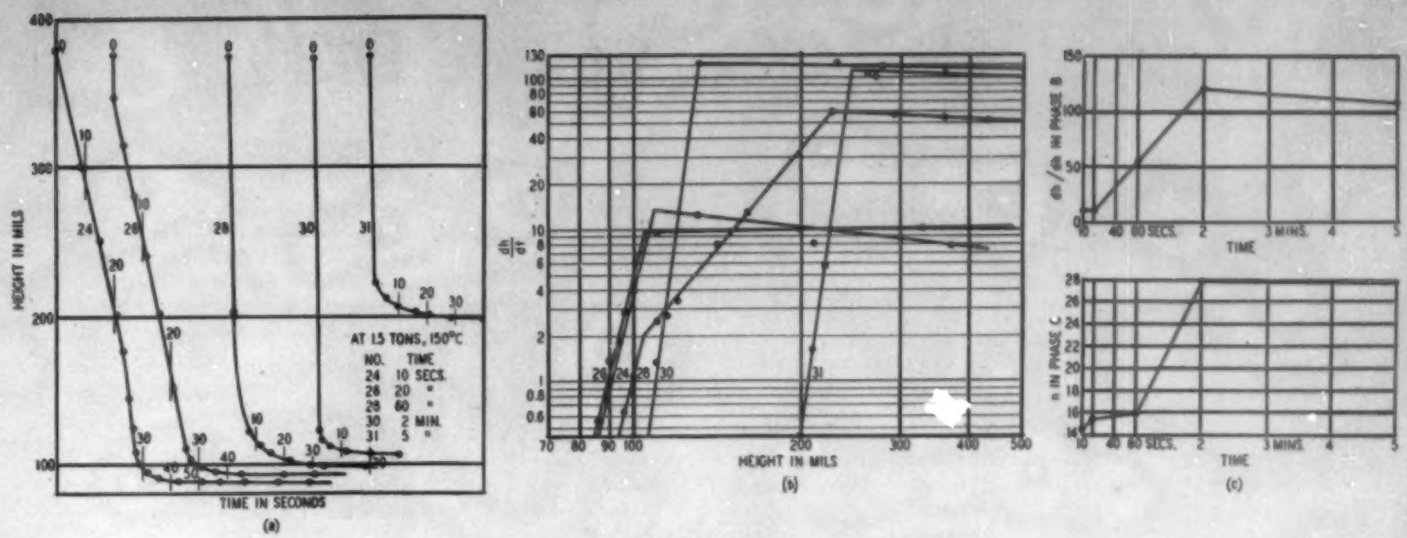


Fig. 6—Effect of preheating on flow

the sign of the slope of log dh/dt vs. log h, is denoted as a positive value indicating acceleration flow rate.

(2) Phase B wherein the velocity of flow, dh/dt, has a high but constant value for a drop in height of approximately a hundred mils. The melting resin tends to decrease in viscosity but concurrently the decomposing hexa is supplying methylene groups to cause three dimensional linkage to occur and oppose flow. The greatest flow occurs in this stage.

(3) Phase C wherein the velocity of flow decreases and the sign of n, the slope of log dh/dt vs. log h curve, changes from zero to a nega- (*Please turn to page 88*)

Table I.—Effect of Six Variables in the Preparation and Conditioning of Preforms on the Plasticity of a Phenolic Molding Composition

	Pelleting Temp., Deg. C.	Pelleting Force, Tons	Pelleting Time, Sec.	Height of Pellet, Mils	Velocity of Flow Phase B, Mils/Sec.	Deceleration of Flow Phase C, n	Treatment
Expt. 1	70	1.5	30	350	9	−14.1*	All the pellets, except those in
Effect of pelleting	70	1.5	60	350	9.4	−14.7	the moisture series, were con-
time	70	1.5	180	350	8.45	−15.1	ditioned at 50% RH 70° F. for 48 hours before testing
Expt. 2	25	1.5	30	350	12.2	−11.8	
Effect of pelleting	50	1.5	30	350	10.5	−13.3	
temperature	70	1.5	30	350	9	−14.1	
	100	1.5	30	500	8.5	−17.5	
Expt. 3	70	1.5	30	350	9	− 8.7	14.1 tons/in.² pelleting pressure
Effect of pelleting	70	2	30	350	9	− 9.6	18.2 " " " "
force	70	3	30	350	9	−10.4	27.3 " " " "
Expt. 4	70	1.5	30	300	11	−12.5	
Effect of various	70	1.5	30	368	11.5	−12.5	
initial heights	70	1.5	30	420	10	−12.1	
	70	1.5	30	464	11	−11.5	
	70	1.5	30	515	10.5	−11.8	
Expt. 5	70	1.5	30	464	42	−20.8	20.6% Moisture
Effect of moisture	70	1.5	30	438	31	−11.2	10.6 "
content on the	70	1.5	30	410	22	− 9.7	5.52 "
flow. Conditioned	70	1.5	30	382	14.8	− 9.4	2.11 "
3 mo.	70	1.5	30	380	12.5	− 8.9	0.95 "
	70	1.5	30	382	11.5	−11.3	0.44 "
Expt. 6	70	1.5	30	380	10	−14.7	Preheated at 150° C. for 10 sec.
Effect of preheat-	70	1.5	30	370	10	−15.4	Preheated at 150° C. for 20 sec.
ing the pellet be-	70	1.5	30	370	55	−15.9	Preheated at 150° C. for 1 min.
fore flowing	70	1.5	30	370	120	−28	Preheated at 150° C. for 2 min.
	70	1.5	30	370	105	−27.8	Preheated at 150° C. for 5 min.

* Negative signs indicate deceleration.

Report of ASTM Committee D-20

ACTION on a variety of testing methods for plastics was reported at the Annual Meeting of the American Society for Testing Materials held in Chicago during the week of June 23. In addition to the new tentative standards and revisions of tentative standards presented to the Society for acceptance by Mr. W. E. Emley, Chairman of Committee D-20 on Plastics, a number of other test methods were advanced by the subcommittees to the point at which they are ready for a letter ballot of the whole Committee. These latter include methods for tensile strength, impact strength, flammability of plastics exceeding 0.05 in. in thickness, and diffusion of light by plastics, and a revision of the method for determining the resistance of plastic materials to various chemicals.

Five papers on plastics were delivered at an evening session on June 24, which was attended by approximately 400 engineers. The titles and authors of the papers are as follows: "Resistance of Plastics to Chemical Reagents" by G. M. Kline, R. C. Rinker, and H. F. Meindl; "Mechanical Tests of Cellulose Acetate" by W. N. Findley; "Factors Influencing the Creep and Cold Flow of Plastics" by John Delmonte; "Shear Strength of Molded Plastic Materials" by John Delmonte; and "Method for Testing Odor-Taste Contamination Tendencies for Phenolic Plastic Closures" by A. Herman. Constructive discussion followed each of the scheduled papers. Through the courtesy of the A.S.T.M., these papers as well as the test methods for plastics which were adopted by the Society will be published in MODERN PLASTICS as space permits.

The following details regarding the Committee's activities are abstracted from its annual report.

Activities of subcommittees

Subcommittee I on Strength Properties (M. H. Bigelow, chairman).—This subcommittee has completed its study of the tensile strength test method and the impact strength methods which have been submitted to letter ballot of the subcommittee.

Subcommittee II on Hardness Properties (W. H. Gardner, chairman).—In addition to a continuation of the study of mar, scratch, and abrasion resistance of plastics, the subcommittee is undertaking the study of plastic bearing materials and their frictional properties, with a view to developing test methods.

Subcommittee III on Thermal Properties (W. A. Zinzow, chairman).—This subcommittee has continued its activities in the study of procedures for the rate of burning, and softening point of various plastics.

Subcommittee IV on Optical Properties (W. F. Bartoe, chairman).—A glossary of optical terms relating to plastics is in preparation. Round-robin tests are being conducted on specimens in accordance with proposed methods of test for clarity, test for surface brightness, and test for surface irregularities.

Subcommittee V on Permanence Properties (G. M Kline, chairman).—Studies on evaluation of the weathering resistance of plastics, resistance of plastics to heat, permeability of water vapor by plastics, and simulation of service conditions are being conducted which, it is expected, will lead to the development of methods of test.

Committee D-20 has approved the definition of "dry room conditions" as 15 percent relative humidity at 85 deg F. and "moist room conditions" as 75 deg. percent relative humidity at 77 deg. F. The committee has also approved the establishment of a standard laboratory atmosphere for testing plastics of 50 ± 2 percent relative humidity at 77 ± 2 deg. F.

New tentative standards

The committee recommended that the following new proposed methods of test be accepted for publication as tentative:

Methods of:

Test for Deformation of Plastics Under Load at Elevated Temperatures.

Preconditioning Plastics and Electrical Insulating Materials, prepared in cooperation with Committee D-9 on Electrical Insulating Materials, and

Test for Color Fastness of Plastics to Light.

Revisions of tentative standards

The committee recommended that the following tentative standards be revised as indicated below and continued as tentative:

Tentative Method of Test for Flammability of Plastics (D 568 – 40 T):[1]

Section 1.—Add the following at the end of this section:

Two alternate methods of ignition are covered as follows:

Method A.—Fusee Method, and

Method B.—Benzol Drop Method.

Section 2.—Add a new Paragraph (*d*) to read as follows:

(*d*) *Benzol.*—Ordinary laboratory grade benzene (C_6H_6).

Section 4.—Add a new italic heading at the beginning of Paragraph (*a*) to read "Fusee Method" and add a new sentence at the end of this paragraph to read as follows:

The square of fusee material shall be ignited by means of a safety match.

Substitute for the first sentence of Paragraph (*b*) a new paragraph to read as follows:

(*b*) *Benzol Drop Method.*—A drop of benzol shall be placed on the test specimen approximately 1/4 in. above the lower edge of the specimen, and allowed to run down to form a large drop on the blunt end without dripping off. This drop shall be ignited within 7 sec. after application to the test specimen with either of the following means: (*1*) a high potential, low energy spark such as delivered by an automobile ignition coil, or (*2*) a safety match. After ignition, the door of the shield shall be closed immediately (Note).

Section 5.—Add a new item 4 to be reported to read as follows: "(*4*) Method of ignition."

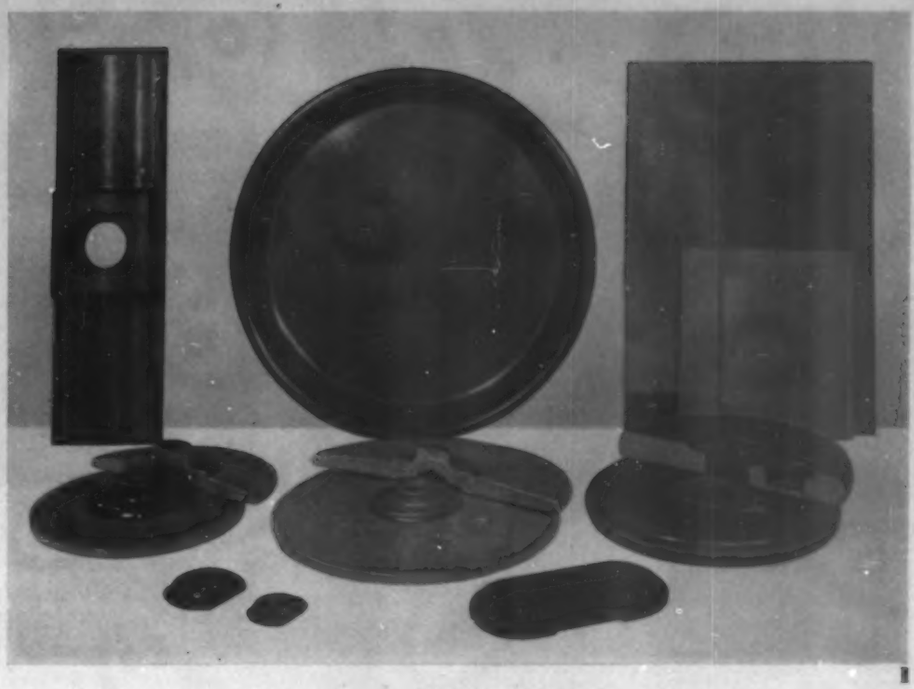
Tentative Method of Measuring Flow Temperatures of Thermoplastic Molding Materials (D 569 – 40 T):[2]

Section 5 (e).—Change the second sentence to read as follows by the addition of the italicized figures and the omission of those in brackets:

Temperature shall be controlled within plus or minus [0.10] *0.50* C.

[1] 1940 Supplement to Book of A.S.T.M. Standards, Part III, p. 284. See also MODERN PLASTICS, vol. 18, p. 62, April 1941.

[2] 1940 Supplement to Book of A.S.T.M. Standards, Part III, p. 286. See also MODERN PLASTICS, vol. 18, p. 58, Dec. 1940.



Strong, cordage fibers combined with synthetic resin are laminated into flat sheets or molded into various shapes of extreme toughness, high impact and low density. Flexible abrasive disks with rigid hubs are molded as units. Material is also available as composition ready for curing and pressing

Reinforcement with sisal

by ARCHIE W. KOON*

THE story of fillers in plastics is an important chapter in the full account of plastics progress. Less captivating to popular and romantic imagination, fillers have supplied their share of bright promise, blighted hopes, and solid accomplishment. Fillers were introduced first to lower costs of molding material; however, it soon appeared that, far from being mere diluents, they contributed unique advantages, including faster and generally more satisfactory molding, improved and more dependable strength, and closer dimensional control. When this became apparent the hunt was on. It was recognized from the start that fillers were especially valuable in connection with thermosetting resins; in the early days of phenolic development, it was largely the use of fillers which made practical application possible. Woodflour and a host of powdered metals, minerals and organic substances were employed. Contributing in varying degrees to the stamina of moldings, they found wide use because they offered minimum impediment to molding into complex shapes.

Applications arose where strength requirements warranted some compromise with molding ease. Typically, cotton flock found a place. A serious price disadvantage was involved, and the development of preforming processes introduced a new demand for free-flowing molding compounds, thus imposing a further restriction on the longer fibered cotton.

A further concession to convenience for the sake of strength was made with the entry of high-impact molding materials, as represented by chopped yarns and fabrics. Preforming in the ordinary sense is impossible, flowing properties are poor, molds are expensive, but high strength provides an expanding field of application for these materials.

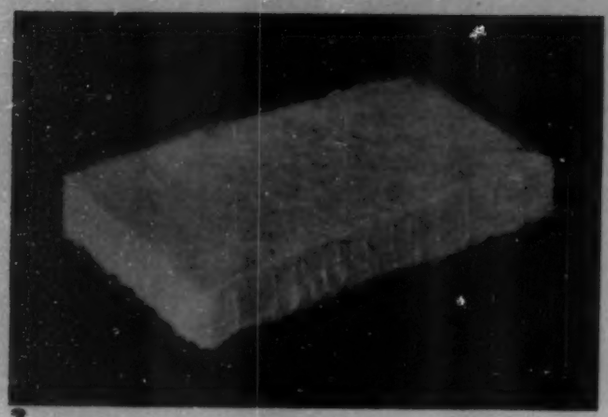
Outside the direct line of account, but entirely germane to the topic, are the laminates of paper or fabrics. Here shaping possibilities are sacrificed almost completely to strength and stamina. Pieces of exceptional sturdiness are achieved, but only as sheets and slabs, or rods, at the most, as simple molded shapes.

There is no reason to believe that either random or laminating fillers have been developed to their full stature. Many materials have been considered unavailable because of cost or of some conspicuous defect among a myriad of virtues. It is more than likely that some of these will be reintroduced with their disadvantages abated.

Against this background may be presented the characteristics of resin-bonded sisal. Here the toughness of cordage fibers is available for the first time in a form which provides convenience of use and latitude in shaping. In addition it offers a combination of other features not attained previously.

The exceptional strength of sisal long has stimulated efforts to use it as a reinforcement for plastics, but it always has seemed intractable. In the Corolite process, the sisal fiber is worked into a fluffy batting. This is consolidated by a needling operation which drives tufts of fiber through the mass. Thus compacted, the material has an apparent density of about 0.15, indicat-

* Columbia Rope Co.



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3

4

2—Prior to application of the resin, tufts of fiber consolidate the fluffy mass of sisal fibers into a compact mass. **3**—The sheet is then cut to shapes appropriate for molding. **4**—A balanced assembly is prepared for molding a 9-in. bobbin head of low density. Pre-compression facilitates molding

ing a volumetric composition of one part fiber to six parts void space. It is firm and will withstand the handling incident to combining with resins.

Resin solutions are applied by spreading or impregnation, depending upon the viscosity of the solution, the type of resin, and the proportion desired. The solvents are driven off by moderate heating, which also has the effect of converting the resin to the *B* stage. The period and degree of heating are regulated to control the properties and finish of the cured material, and to prevent loss of resin through squeezing out under pressure as it passes through a liquid stage.

The fiber and resin thus combined are ready to be pressed into sheets and slabs according to usual laminating practice. Exceptional convenience is afforded by the high weight available in impregnated sisal, five times that of any canvas capable of penetration by resin solutions. Through this circumstance, it is possible to press dense sheets up to 0.15 in. thick using but one layer of fiber. Besides facility of press loading, there is provided a greater thickness of uniformly interlaced filler, without intervening hard surfaces adhering together through the cementing action of the resin alone. Further, the needling process leaves these fewer inner surfaces so open as to induce mechanical interlocking.

Properties

The properties of resin-bonded sisal can be varied and controlled over a considerable range. Naturally there are limits, and to obtain extreme values in one direction, some compromise must be made in others. For example, highest impact is likely to be associated with lowered water resistance and elastic modulus. Properties attained in commercial practice are shown in the following tabulation:

	Range	Typical
Molding temperature, deg. F.	275–350	300
Molding pressure, lb. per sq. in.	300–3000	2000
Compression ratio	2–5	4
Specific gravity	0.70–1.35	...
Tensile strength, lb. per sq. in.	7000–12000	11000
Flexural strength, lb. per sq. in.	16000–20000	18000
Compressive strength, lb. per sq. in.	10000–35000	30000
Impact strength, ft. lb. per in. of notch, $1/2 \times 1/2$ in. notched bar, Charpy test	3–16	8
Flexural modulus of elasticity, lb. per sq. in.	400,000–1,200,000	800,000
Water absorption, 24 hr. immersion, per cent	0.5–15.0	...

Attention is called particularly to the low density attainable in Corolite, yielding a product comparable in this respect to wood. The natural loftiness of the sisal and carefully planned resin distribution make possible this unique effect. It is especially valuable where substitution for wood by a plastic composition of high toughness in all directions is desired, but where an increase in weight is inexpedient. An obvious use of this feature is in aircraft construction. It has led to successful application in textile bobbins manufacture.

Molding characteristics

The combination of resin and fiber has been presented thus far as a laminating mate- (*Please turn to page 84*)

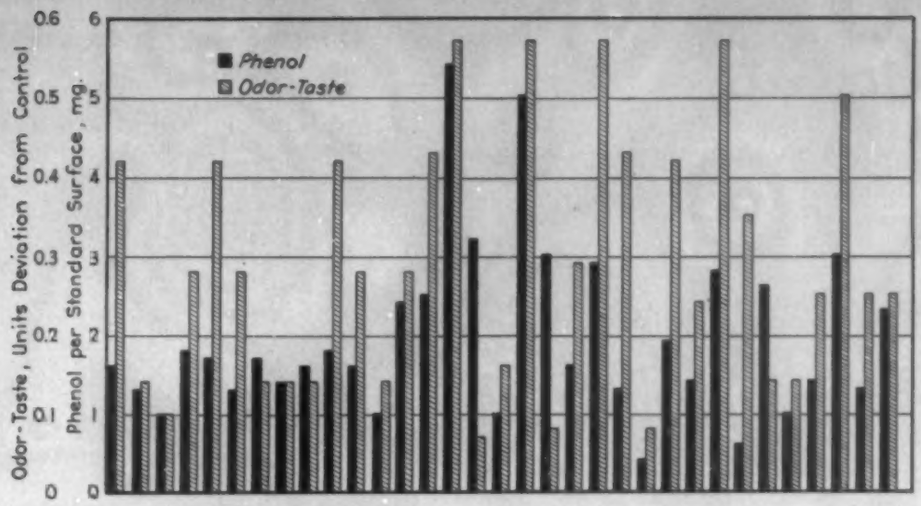

Fig. 1—Comparison of chemical and odor-taste tests for molded phenolic plastic closures

Odor-taste test of phenolic closures[1]

BY A. HERMAN[2]

PHENOLIC plastic closures have come into widespread use for closing liquor and other beverage containers. While many advantages are apparent, closures made from phenolic plastic sometimes tend to produce foreign odors and tastes around the necks of containers and, in some cases, contaminate the main body of the liquor.

Temporarily, the following method to test phenolic plastic closures before use was adopted: A definite number of closures were immersed in a definite amount of whiskey or gin, depending upon the proposed use of the closures, for a standard length of time at constant temperature. The liquor was then removed and the taste of the samples compared with the taste of untreated liquor under conditions eliminating all other variables such as temperature, light, alcohol concentration and personal prejudices or taste-fatigue of the observer.

While a method of this sort is practical in that it tests the material directly for the effect under question, it could not be used as a specification to be presented to a manufacturer of closures. In addition to this, the test consumes too much time. A fast, accurate, chemical test which would evaluate closures in approximately the same order as the taste test was needed.

Closures are made of phenol-formaldehyde plastic, dyes and pigments, and wood flour filler. In two-stage resins, hexamethylenetetramine is used in order that the caps may be properly molded. This sometimes results in loosely combined ammonia being left in the cap. The most important contaminant is free phenol and the cresols associated with it. The chemical test devised was centered around the phenol test and the test for presence or absence of ammonia, the other possible contaminants being only of secondary importance.

Several tests are known for quantitatively measuring phenol, falling into two classes: bromination methods and colorimetric methods. In preliminary tests for a bromination method, four caps were extracted with 100 ml. of 100 proof ethyl alcohol at room temperature for one week. An aliquot of the liquor was then taken, the phenol fixed with sodium hydroxide, and the solution evaporated to dryness. The sodium phenolate was taken up in water, brominated with a standard bromide-bromate solution, and the excess bromine determined with potassium iodide and sodium thiosulfate. The method was not satisfactory because it took too long and the evaporation to remove the ethyl alcohol was accompanied by a loss of phenol.

The colorimetric methods depend upon the reduction of phospho-molybdic or phospho-tungstic salts by phenol in alkaline solution. The blue color developed is compared with that similarly produced in standards containing known amounts of phenol. For these tests, four caps were immersed in 100 ml. of 100 proof alcohol at 45 deg. C. for 16 hrs. An aliquot was treated with the reagent and compared with the standards.

A series of tests was run using various methods of extraction. The extracts from these were analyzed by the bromination and colorimetric methods.

The results of these tests can be summarized:

1. When water is used for extracting phenol, the bromination method is superior to the colorimetric.

2. The colorimetric methods have three bad defects: (*a*) Interference colors are formed in extracts made at high temperatures; (*b*) the range of accuracy is limited, being confined to small amounts of phenol; and (*c*) it is necessary to employ the bromination method in order to make up accurate phenol standards.

3. Hot water at 75 deg. C. will extract as much or more phenol than 100 proof alcohol at 38 deg. C.

(*Please turn to page 82*)

[1] This paper was presented at the Annual Meeting of the American Society for Testing Materials in Chicago, Ill., June 24, 1941, and is published here by permission of that Society.

[2] Asst. to vice-president, Joseph E. Seagram and Sons, Inc.

Plastics digest

This digest includes each month the more important articles (wherever published) which are of interest to those who make plastics materials or use them. Requests for periodicals mentioned should be directed to the individual publishers.

General

GLASS VERSUS ELASTI-GLASS. The Glass Industry 22, 303–4 (July 1941). Outcome of the Federal Trade Commission's suit against S. Buchsbaum and Co., Chicago, will determine whether plastic products with glassy names are being sold unfairly in competition with glass. The first hearing took place in Chicago on April 3; the second a week later in Toledo, April 11. Further hearings will be held, probably during August or September. Attorney for the Commission, Eldon P. Schrup, has called two technical witnesses for questioning on the subject of what is glass and is there such a thing as organic glass. These were Dr. J. C. Hostetter of the Hartford-Empire Co. and Dr. J. D. Ryan of the Libbey-Owens-Ford Glass Co. Both of these experts limited their definitions of glass to inorganic products. Other glass technologists will be called when testimony is resumed to finish the presentation of the Commission's case, after which the defense will be given an opportunity to present their evidence before the trial examiner, William C. Reeves. Meanwhile, according to The Glass Industry, the case of glass versus plastic remains one of the greatest import to the entire glass industry.

A.S.T.M. COMMITTEE OFFERS DEFINITION OF GLASS. The Glass Industry 22, 216 (May 1941). Committee C-14 on Glass and Glass Products has prepared the following definition of "glass" for consideration by the American Society for Testing Materials. "Glass is an inorganic product of fusion which has cooled to a rigid condition without crystallizing. Some glasses contain non-glassy material, always embedded in a glassy matrix. Glasses may be colored by suitable material in a dissolved or dispersed condition." A classification of inorganic glasses into one-component, two-component and multi-component glasses with various subclasses for the latter group is then presented.

(This definition, prepared by inorganic glass technolcgists, does not recognize the existence of organic glass. It is the equivalent of starting a definition of a plastic by stating, "A plastic is an organic product." To the layman the terms "transparent" and "glass" are practically synonymous. Organic plastics have been sold to the public for many years under trade names which include the expression "glass" or "glas" to denote transparency. Papers coated to render them transparent are sold as "glassines." These trade names have always been modified to distinguish between the modern organic transparent products and the inorganic glass of antiquity. It is just as reasonable to recognize the existence of organic and inorganic glasses as it is to distinguish according to accepted practice between organic and inorganic plastics.)

PLASTICS IN THE NATIONAL DEFENSE. R. J. Moore. Trans. Am. Inst. Chem. Eng. *37*, 521–46 (June 25, 1941). The general types of resins used in modern plastics and the many diverse industries in which plastics play important roles are reviewed. Their value as engineering materials is stressed. Defense today is dependent on both military and industrial efficiency. In both of these branches, directly in military equipment and indirectly through efficient industry, plastics are playing a strategic part.

PLASTICS—THE REAL FACTS. Modern Industry 2, 20–3 (July 15, 1941). The situation with regard to shortages of plastics because of increasing military applications is surveyed. Not all types of plastics are currently faced with lack of the necessary raw materials. The underlying reasons for the shortages that exist and the probable sources of relief are discussed. The roots of the trouble are cited as (1) delayed deliveries of presses, (2) nonavailability of skilled mold-makers, (3) rationing of nickel steel needed for molds, and (4) limited equipment capacity for making plastics and their raw materials. The last is said to be the most serious, but substantial new plant capacity now under construction should relieve the jam.

Materials and Manufacture

PLASTICIZING LAC FILMS—PART II. G. D. Heath and B. S. Gidvani. London Shellac Research Bureau Tech. Paper No. 20, Apr. 1941. The effect of 30 plasticizers on the properties of the films of dewaxed lac and fibrous and hard lac resin made from the dewaxed lac, was studied. Prevention of crazing, resistance to water and solvents, drying, scratch hardness, flexibility, adhesion and corrosive action on copper wire were investigated. The following are good general plasticizers for all shellacs: methyl cyclohexanol phthalate, cyclohexanol tartrate, *p*-toluene sulfonamide and cyclohexyl *p*-toluene sulfonamide.

RESIN-TREATED, LAMINATED, COMPRESSED WOOD. A. J. Stamm and R. M. Seborg. Trans. Am. Inst. Chem. Eng. *37*, 385–98 (June 25, 1941). The treatment of veneer with an unpolymerized water-soluble phenol-formaldehyde resin-forming mix in such a way that the resin-forming constituents are deposited within the fine cell-wall structure and chemically bonded to the structure makes possible the compression of the treated plies under much lower pressures than would otherwise be necessary. The product also has a water resistance not obtainable by other processes. The treatment makes it possible to manufacture plywood with compressed resin-treated faces and an uncompressed core in a single compression and assembly operation. Properties of the materials are given and possible uses in airplane construction, flooring, paneling and furniture manufacture are discussed.

MODERN PLANT MAKES PHENOLIC RESINS AT SPRINGFIELD. J. R. Callahan. Chem. and Met. Eng. *48*, 88–90 (June 1941). The Resinox plant, largest of Monsanto's units for producing resins at Springfield, Mass., typifies the modern in process plant layout and design. Cleanliness, safety, comfort of employees and liberal use of automatic and remote control of operations are major considerations in this plant, which is estimated to have an annual capacity of 15,000,000 pounds of phenol-formaldehyde molding compound. As soon as the formaldehyde raw material situation is clarified, it is planned to make an addition to the plant which will increase output by at least 50 percent.

FORMALDEHYDE. H. W. Homer. Chem. and Ind. (London) *60*, 416–17 (May 31, 1941). Abstract of a lecture and discussion. A solution containing 40.2 percent formaldehyde wt./vol. and 10.0 percent methyl alcohol wt./wt. and of specific gravity 1.09 at 15° C./15° C. met the needs of the molding material industry for many years. The principal difference in various grades of formalin is the proportion of methyl alcohol, which largely determines the stability of the solutions in storage. The solid polymers which precipitate from the cold solutions range from simple polymers of the type C_2H_2O to polymethylene glycols of the type $(CH_2O)_nH_2O$, where n varies between 6 and 50. Even 40 percent formalin contains not more than 10 percent of formaldehyde as HCHO. Methods of analysis and storage problems were also discussed. The cheapest and safest method of storage is said to be in acid-resistant lined concrete tanks.

Tenite extruded by
The Rex Co., Inc.
Slipper made by the
Vale Shoe Co.

Extruded strands

of Tenite, some as fine as .025" in diameter, create this modern Cinderella slipper. Strong yet pliant, the transparent Tenite strands are interwoven with Kodapak metallic thread into a lacy fabric that is long wearing and conforms comfortably to the shape of the foot.

Tenite is continuously extruded in countless shapes and sizes, varying from fine threadlike strands to 3-inch wide strips. The development of this Tenite molding process gives manufacturers a new material for fabricating products which formerly had to be made of metal, glass, or wood. Among its important applications are wallboard joinings, table trim, shelf edgings, woven furniture, insulation tubings, and automobile upholstery trim.

Tenite is a thermoplastic molding composition outstanding for its colorful beauty, hornlike strength and toughness. A 28-page illustrated book on its properties and uses will be sent on request.

• • •

TENITE REPRESENTATIVES: *New York*, 10 East 40th Street. *Buffalo*, 1508 Rand Building. *Chicago*, 1564 Builders' Building. *Detroit*, 904-5 Stephenson Building. *Leominster, Massachusetts*, 39 Main Street . . . Pacific Coast: Wilson & Geo. Meyer & Company—*San Francisco*, Federal Reserve Building; *Los Angeles*, 2461 Hunter Street; *Seattle*, 1020 4th Avenue, South.

TENNESSEE EASTMAN CORPORATION
Kingsport, Tenn. ***Subsidiary of Eastman Kodak Co.***

TENITE an Eastman plastic

U. S. plastics patents

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 10 cents each

AUTOMOBILE BODY. Oskar Siebler. U. S. 2,242,269, May 20. A light, thin-walled automobile body composed of material saturated with a synthetic resin and having a chassis frame with a transverse floor brace joined to the bottom of the body by a synthetic resin cement.

PLASTICIZED POLYAMIDE. G. T. Vaala (to E. I. du Pont de Nemours and Co.). U. S. 2,243,662, May 27. A synthetic linear polyamide is plasticized with a high-boiling carboxylic acid.

LEATHER SCRAP PLASTIC. Robert P. Gutterman. U. S. 2,243,700, May 27. A molding powder is made by treating leather scrap with a phenol in water, liquefying the treated leather by heating with an acid, heating the product with an aldehyde, drying it and grinding the dried product.

LEATHER SUBSTITUTE. F. Löblein (to Deutsche Celluloid-Fabrik Akt.). U. S. 2,243,736, May 27. Artificial leather with durable multicolored grain is produced by applying differently colored vinyl resin foils to a support, hot-pressing and then graining the material on a calender.

CORROSION RESISTING YARN. Robert S. Owens. U. S. 2,243,917, June 3. Yarns and fabrics are made of spun glass, vinyl resin or Bakelite fiber with a rubber, acrylic resin or nitrocellulose binder and a rubber, chlorinated rubber, polychloroprene, ethylene polysulphide or vinyl chloride resin cover.

VINYL RESIN FINISH. C. W. Patton (to Carbide and Carbon Chemicals Corp.). U. S. 2,244,020, June 3. Dispersing carbon black and a vinyl resin in an ammoniated organic medium and then in a solvent for the vinyl resin.

POLYMER. R. Rosen and R. M. Thomas (to Standard Oil Development Co.). U. S. 2,244,021, June 3. A heat-stable polyisobutylene with molecular weight above 27,000, containing 0.01 to 5 percent of a phenol or thiophenol.

PLASTICIZERS FOR POLYAMIDES. P. R. Austin (to E. I. du Pont de Nemours and Co.). U. S. 2,244,183, June 3. Plasticizing synthetic linear polyamides with sulfonamide-formaldehyde condensation products.

UREA-POLYAMIDE RESIN. P. R. Austin and B. Graham (to E. I. du Pont de Nemours and Co.). U. S. 2,244,184, June 3. Condensing a diamine with a dicarboxylic acid in presence of urea, and condensing the product with formaldehyde.

COLD-WORKED POLYAMIDES. J. B. Miles, Jr. (to E. I. du Pont de Nemours and Co.). U. S. 2,244,208, June 3. Cold-working fiber-forming synthetic linear polyamides by applying sufficient pressure to cause the polymer to flow.

MOLDING COMPOSITION. M. H. Bigelow (to Plaskon Co., Inc.). U. S. 2,244,283, June 3. Grinding a urea resin with a zirconium, titanium or cerium soap of a hydroxystearic, hydroxypalmitic, stearic or palmitic acid.

INFUSIBLE RESIN. D. E. Cordier (to Plaskon Co., Inc.) U. S. 2,244,289, June 3. Condensing *n*-butylbiuret with formaldehyde to form a resin which becomes infusible when heated.

RESISTOR. G. F. Benkelman (to Continental Carbon, Inc.). U. S. 2,244,548, June 3. Molding an intermediate thermosetting phenolic condensation, containing a conducting powder, into a resistance element.

MULTICOLOR MOLDINGS. Leo Nast (to Universal Plastics Corp.). U. S. 2,244,566, June 3. Making moldings from a thermosetting resin composition, in three layers alike in composition but different in color, integrally molded together to give multiple color effects.

METHACRYLATE INTERPOLYMERS. L. P. Hubbuch (to E. I. du Pont de Nemours and Co.). U. S. 2,244,702–3, June 10. Polymerizing an alkyl methacrylate with not more than half its weight of free methacrylic acid; and polymerizing free methacrylic acid, in ratios from 3:7 to 49:1, with its nitrile or amide or with an alkyl methacrylate, then converting the polymer to a water-soluble salt.

METHACRYLATE TEXTILE SIZE. M. M. Brubaker (to E. I. du Pont de Nemours and Co.). U. S. 2,244,704, June 10. Sizing cellulosic textiles with an aqueous solution of 0.5 to 5 percent of a soluble salt of an interpolymer of methacrylic acid and an alkyl methacrylate.

OILPROOF PAPER BAG. F. E. Williams (to Marbon Corp.). U. S. 2,244,795, June 10. A paper bag adapted to retain oil is made of paper with an oilproof volatile softener, and a rubber hydrochloride coating on both sides.

MOLDING MACHINE. E. R. Knowles (to Watson-Stillman Co.). U. S. 2,244,842, June 10. An injection molding machine having a cylinder, detachably mounted on a supporting head, to receive the charge of molding composition.

VINYL RESIN DISPERSION. B. M. Marks (to E. I. du Pont de Nemours and Co.). U. S. 2,245,040, June 10. Coating the particles of a vinyl acetate resin powder with a solid lubricant and dispersing the powder in an aqueous medium.

PRINTED FABRIC. M. Belloc (to Société Nobel Française). U. S. 2,245,123, June 10. Printing on fabrics with a solution of a plasticized vinyl acetoformal resin.

LINEAR POLYAMIDES. C. H. Greenewalt (to E. I. du Pont de Nemours and Co.). U. S. 2,245, 129, June 10. Making linear polyamides by pressure-heating a substance having amino and nitrile groups, the reaction carried out in presence of water.

BRAKE LINING. J. N. Kuzmick (to Raybestos-Manhattan, Inc.). U. S. 2,245,203, June 10. Compounding a thermosetting synthetic resin with a sugar ester and asbestos fiber and molding the product into brake linings.

COATED PHOTOGRAPHIC FILM. T. F. Murray, Jr., and W. O. Kenyon (to Eastman Kodak Co.). U. S. 2,245,218, June 10. Protecting finished film from abrasion by a coating of cold-water-soluble vinyl acetal resin.

PLASTICIZERS. Henry B. Smith (to Eastman Kodak Co.). U. S. 2,245,232–3, June 10. Plasticizing a vinyl butyral resin with the butyl ether of diethyleneglycol succinate; and plasticizing cellulose ethers or esters with butyl butoxyacetate.

(*Please turn to next page*)

MANY manufacturers who are finding it difficult to procure metal trim are turning to plastics as a substitute. As several plastic materials are resistant to grease, oil and other compounds, Erie Extruded Plastics offers many possibilities for use instead of leather, cotton, yarn, etc. Larger extruded sections are lowering costs and bringing new decorative beauty in trim on radios, refrigerators, automobiles, washing machines and other appliances, where metal was formerly used.

Erie Extruded Plastics is molded in continuous strips and can be supplied in any desired length, in strips or coils, depending on the thickness of the section. Erie molding engineers have developed several precision controls for this type of molding, making it possible to maintain uniform size and surface finish, regardless of the length of the material. Complete facilities for painting, stamping, drilling and tapping make it possible to furnish extruded plastics in finished form ready for final assembly. For complete extrusion molding service, send your inquiries to Erie.

Plastics Division

ERIE RESISTOR CORPORATION, ERIE, PA.

COATING. Geo. Alexander (to General Electric Co.). U. S. 2,245,245, June 10. Making a resin by alkaline condensation of a phenol with formaldehyde, and incorporating the resin in a solvent for use in coating and impregnating compositions.

CURLING SYNTHETIC FIBERS. H. I. Waterman and W. L. J. de Nie (to Shell Development Co.). U. S. 2,245,310, June 10. Vinyl resin fibers are made wavy by dipping in a sulphur chloride bath for 2 minutes or less.

UREA RESINS. A. Menger, E. Bock and P. Didden (to Plaskon Co., Inc.). U. S. 2,245,491, June 10. Making a water-insoluble but reactive thermosetting acid-hardenable urea-formaldehyde resin for use in coatings and adhesives.

COATED WRAPPING FOIL. F. H. Reichel and A. E. Craver (to Sylvania Industrial Corp.). U. S. 2,245,499, June 10. Coating wrapping foils with a composition of a cellulose ether, ester or hydroxyalkyl ether, and a wax solution having a small amount of water dispersed therein.

VINYL CHLORIDE RESIN. H. Rein and K. Rössler (to I. G. Farb. Akt.). U. S. 2,245,500, June 10. Plasticizing a vinyl chloride resin with not over 5 percent of free sulphur.

STEREOTYPE MAT. F. E. Davenport (to Knowlton Bros.). U. S. 2,245,555, June 17. Coating one face of a fibrous felted mat with a hard tough thermoplastic and hot-pressing a type form against the opposite face.

POLYSTYRENE. J. T. Stearn (to United Gas Improvement Co.). U. S. 2,245,619, June 17. Adding a volatile solvent to a light oil styrene fraction, distilling off the solvent and continuing to apply heat until the styrene is polymerized.

VINYL RESIN COATING. C. W. Patton (to Carbide and Carbon Chemicals Corp.). U. S. 2,245,708, June 17. Dispersing a vinyl acetate:vinyl chloride interpolymer in a high-boiling liquid such as butyl (or benzyl) glycol ether for use as a coating giving strong, flexible films.

EMULSION POLYMERIZATION. C. H. Alexander and H. Tucker (to B. F. Goodrich Co.). U. S. 2,245,742, June 17. Interpolymerizing vinyl chloride with at least 1/3 its weight of vinylidene chloride in aqueous emulsion.

ALUMINUM PAINT. G. L. Ball (to Ball Chemical Co.). U. S. 2,245,745, June 17. Using an oil-soluble thermoplastic resin in alkali-proof aluminum paints.

DENTURES. Chas. S. Ballard. U. S. 2,245,849, June 17. A mold for making synthetic resin dentures has a metal incasement which is lined with plaster for making impressions from a wax model which is melted out by heat from a molten metal.

COLORED POLYSTYRENE. Sylvia M. Stoesser and O. A. Braley (to Dow Chemical Co.). U. S. 2,246,020, June 17. Treating styrene with metallic copper and polymerizing by heat to form a colored polymer.

BEARING. P. R. Austin (to E. I. du Pont de Nemours and Co.). U. S. 2,246,086, June 17. Fitting machine bearings with a bearing surface of high molecular weight polyamide which can operate either with or without a lubricant.

FILM. E. D. Bailey and M. M. Brubaker (to E. I. du Pont de Nemours and Co.). 2,246,087, June 17. A plane polarizing film has a light-polarizing substance dispersed in a cold drawn film of a high synthetic polymer.

BEARING. L. Gilman (to E. I. du Pont de Nemours and Co.). U. S. 2,246,092, June 17. Making machine bearings of a solid ethylene polymer.

NONYELLOWING ENAMEL. S. Graves (to E. I. du Pont de Nemours and Co.). U. S. 2,246,095, June 17. Using a modified alkyd resin and an alcohol modified urea-formaldehyde resin in pigmented baking enamels.

SULPHIDE RESIN. R. Rosen (to Standard Oil Development Co.). U. S. 2,246,321, June 17. Forming a disulphide of a butyl-, amyl- or hexylphenol and condensing the disulphide with formaldehyde.

MOLDED ARTICLES. J. O. Whiteley, Jr. (to Dentists' Supply Co.). U. S. 2,246,332, June 17. Hardening a plastic reproduction material in a flexible mold which has been swelled by a solvent.

MOLDING MACHINE. F. W. McIntyre (to Reed-Prentice Corp.). U. S. 2,246,414, June 17. In a molding machine for thermoplastics an inner and an outer die are provided in movable relation to the injection nozzle.

MOLD CAVITIES. L. D. Garratt (to Industrial Colloids Co.) U. S. 2,246,463, June 17. Graphiting mold cavities by applying an aqueous graphite dispersion to the hot surface, then heating to a higher temperature.

ANION EXCHANGE RESINS. E. Melof (to National Aluminate Corp.). U. S. 2,246,526–7, June 24. Condensing a monoacylated aromatic polyamine with formaldehyde or acetaldehyde and deacylating the product, or condensing toluidine with formaldehyde, nitrating the product and reducing the nitro group to an amine group, to form resins capable of anion exchange in treating water.

EXTRUDING PLASTICS. E. J. Roth (to Joe Lowe Corp.). U. S. 2,246,758–9, June 24. An extrusion machine is fitted with a vacuum device which extrudes plastics from an orifice under pressure applied by evacuating one end of the plastic column.

LIGHTED UMBRELLA. Anna L. Campbell. U. S. 2,246,836, June 24. An umbrella stick and tip are molded from methyl methacrylate resin, with a pair of spaced arms molded from the same resin and a lighting unit between the spaced arms to transmit light to the tip.

POLYVINYL ALCOHOL. C. Dangelmajer (to Resistoflex Corp.). U. S. 2,246,915, June 24. A heat-stabilized flexible plasticized polyvinyl alcohol composition.

INSULATION. Paul Nowak (to General Electric Co.). U. S. 2,247,064, June 24. Improving the low temperature impact strength of vinyl resin insulating compositions by compounding the resin with separately polymerized butyl acrylate.

RESIN BLENDS. L. M. Geiger and W. D. Johnston (to Neville Co.). U. S. 2,247,154, June 24. Blending a coumarone resin with Vinylite and Nevillac by mixing and agitating melts of the resins.

LIGNOCELLULOSE MOLDINGS. A. W. Schorger and J. H. Ferguson (to Burgess Cellulose Co.). U. S. 2,247,204–5–6, June 24. Water-cooking a natural lignocellulose product in presence of insufficient alkali for complete neutralization of acids present in the product, or in presence of an organic solvent, to form a thermoplastic molding composition. (*Please turn to page 98*)

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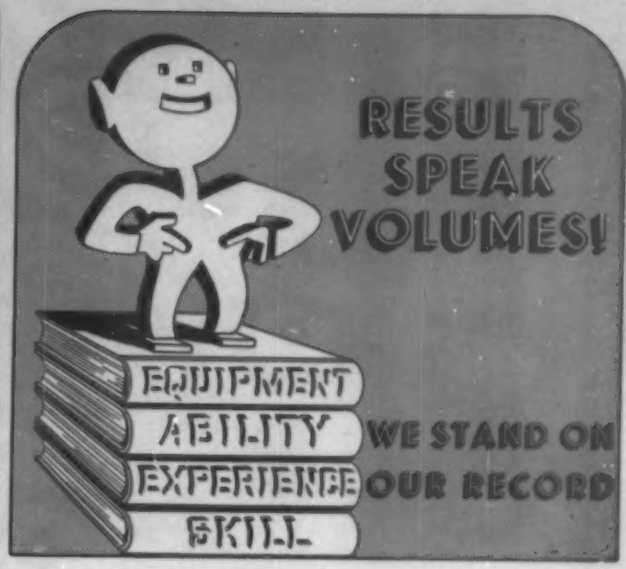

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The following random notes on the British plastics industry were mailed to us in June 1941 by Denys Val Baker, Managing Editor of Shelf Appeal, *an English packaging and display trade journal. Mr. Baker's comments are undoubtedly the most interesting we have obtained from London to date.*

LATEST of the various restrictions is a limitation order, by the Secretary of Mines, on supplies of anthracene and phenol. Now no distiller or importer may dispose of phenol or phenol mixtures except by license. The controlled products include carbolic acid derived from any source and having a melting point within range of 39–41 deg. C., and also mixtures of phenol with any diluent and containing not less than 80 percent by weight of phenol.

Phenol producers now require licenses to dispose of their material. The first of these licenses have been issued for June and will henceforward be issued quarterly. A schedule of fixed prices for phenol has also been introduced by the Coal Tar Controller, by arrangement with the producers. The new prices* range from $9^1/_4$ *d.* (or about 18¢ a lb.) for 20 tons and over, to $10^3/_4$ *d.* (or approximately 20¢) for quantities under one ton.

The position of plasticizers for cellulose acetate plastics is still the same. Mainstay of acetate plastics in this country are aryl phosphates such as triphenyl phosphate and the lower alkyl phthalates, and production of these is controlled by the available supplies of phenol and phthalic anhydride. Owing to shortages of phthalates, it has been necessary to limit their use to work of direct Government importance. This is leading to an increasing use of acetate film scrap for less essential purposes, since this already has a plasticizer addition which for many purposes need not be supplemented. Reasonable supplies of this material, both clear and colored, are available, and are helping out the supplies of both plasticizers and raw cellulose acetate.

Although the Government has now banned the use of cellulose acetate for any form of non-essential packaging or, indeed, any sort of non-essential production, it is in tremendous demand for many of the war trades. Again, although some of these developments will cease when the war ends, there is no doubt much valuable experience being gained from the experiments with acetate plastics and other thermoplastics. It is suggested that the thermoplastics will continue to gain at the expense of thermosetting products. Then there is injection molding, which still has not reached its peak in this country.

At the last pre-war Leipzig Fair, molded goods of melamine resin were one of the main features. Now British Industrial Plastics, Ltd., have just introduced these products over here. Ultimate raw material for their manufacture is calcium carbide, which is converted by heat and atmospheric nitrogen into calcium cyanamide and then dicyandiamide, which is turned into melamine by treating with ammonia. On the Continent the production of melamine is carried out under high pressure, but B.I.P. have developed a patent process which does not employ expensive high-pressure plant and is capable of giving 90 percent yields. There are numerous ways in which the melamine resins can be applied. Molding powders made from the resins will be very suitable for applications such as tableware, bathroom fittings (i.e., shower heads) and so on—because of the exceptional water resistance of these compounds.

Attempts are now being made in England to develop soya bean production, with a view to using it as a raw material for plastics. At the National Institute of Agricultural Botany, Cambridge, it has been decided, as the results of lengthy experiments, that only the Jap and Brown C varieties of soya beans have a chance of ripening over here.

*Ed. Note: *Comparative prices in the U. S. A. for similar grades range from about 11¢ to 13¢ per pound.*

The Plastics Controller has now agreed to issue special licenses to plastics firms who urgently require steel for the following purposes: new buildings and extensions, repairs and maintenances of buildings, new plant and machinery, repairs to plant and machinery, jigs and molds. However, it is emphasized that owing to the necessity of conserving steel for essential purposes, specific Government contract numbers must be given in support of all special applications of steel.

Nylon has at last found its way (on the manufacturing side) into England. At the 28th ordinary general meeting of Courtaulds, Ltd., Mr. Samuel Courtauld announced that Courtaulds had just launched a new company, British Nylon Spinners, Ltd., which had already begun production. However, he pointed out that, although there was much interest in the product, nylon, and although it had great possibilities, there was not much likelihood of any large quantities becoming available for some time to come. Imperial Chemical Industries, Ltd., are also reputed to be starting nylon production over here.

Following the shortages of various plasticizers which have to be imported, Howards and Sons, Ltd., of Ilford, Essex, are now introducing Plassitil (glycerol monolactate triacetate), a plasticizer for both nitrocellulose and cellulose acetate. For the new plasticizer, the makers claim that it has outstanding resistance to mineral oils and petroleum hydrocarbons and films containing it retain their plasticity at low temperatures.

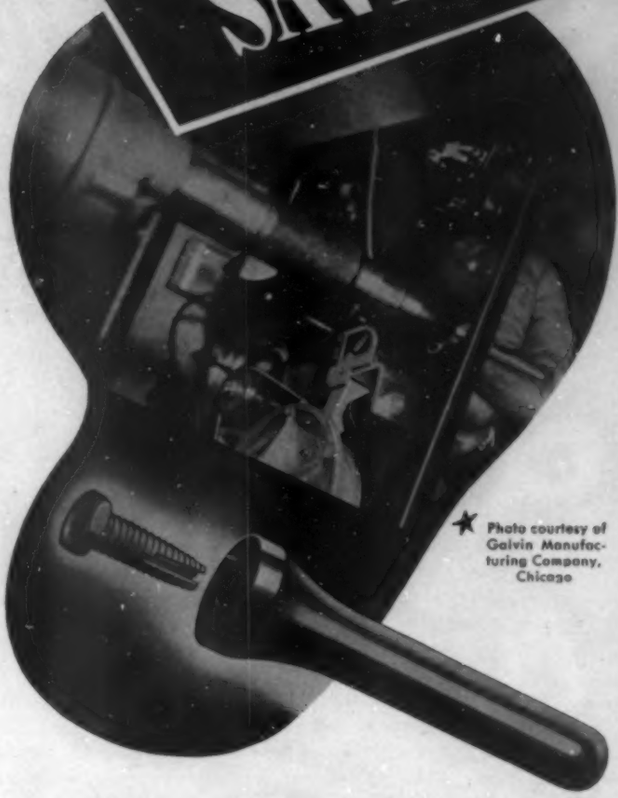
As a result of a recent conference between a deputation of the Molders Section of the British Plastics Federation (together with representatives of the Mold and Tool Makers Section) and the Board of Trade, it has been decided that molds and dies for the production of plastic goods, *whether under the category of Government, export or civil work*, do not come under the limitations imposed by the recent Machinery and Plant Control Order—therefore licenses for their acquirement need no longer be obtained.

The Government's Concentration of Industry scheme will not be applied to the British plastics industry. The Board of Trade have agreed that most plastic firms are already adhering to the principles embodied in the scheme—in that firms with a surplus of Government or export work are sharing it out with other members whose plants do not happen to be fully occupied—and therefore there is no necessity to apply the scheme. At a meeting between representatives of the British Plastics Federation and the Board of Trade, the Federation was congratulated on the highly organized state of its industry.

The British Plastics Federation is in full swing, with its membership up to 127 firms. Among its present activities are: working out of a scheme for short-term training at Government Centers for fitters, lathe turners and millers; formation of a special committee to investigate ways and means of dealing with post-war problems; and the developments of exports. In connection with exports, incidentally, the Plastics Export Group have appointed overseas joint agents and sub-agents who will act in their respective territories throughout the world as the representatives of all 45 member-firms of the Group. Each of these agents is being supplied with large supplies of the 70-page catalog which has recently been published by the Group, cataloging and picturing more than 400 different plastic articles. The appointment of the agents is one of the steps taken to avoid competition among member-firms' agents, under the "old order." Minimum export selling prices have also been agreed upon.

An encouraging sign of the virility of the British plastics industry is the appearance of the British Plastics Year Book, 1941, published by British Plastics. This, the eleventh edition, totals no less than 470 pages, divided into various sections, and supported by 80 advertisers.

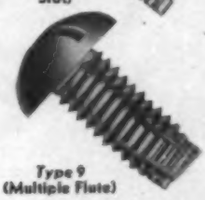
Insert Cost SAVED!



★ Photo courtesy of Galvin Manufacturing Company, Chicago

SHAKEPROOF

Type 2 (Double-width Slot)



Type 9 (Multiple Flute)

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Illustrated above is a typical application of Shakeproof Thread-Cutting Screws. No threaded inserts or separate tapping operations are required. Each screw cuts its own thread in any type and thickness of plastic, and the resulting perfect fit assures a stronger and tighter fastening. Save money—save time—with Shakeproof Thread-Cutting Screws!

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Write direct to the publishers for these booklets. Unless otherwise specified, they will be mailed without charge to executives who request them on business stationery. Other books will be sent postpaid at the publishers' advertised prices

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Plastics Mold Designing

by Gordon B. Thayer

American Industrial Publishers, Cleveland, Ohio, 1941

Price $2.50 **64 pages**

Plastics Mold Designing is an authoritative little volume which offers an important contribution to the subject of mold designing and construction. The author has clearly described the various classes of molds which are used in compression and injection molding; advantages and disadvantages in certain types, and the pitfalls that lie in wait for the molder. Detailed descriptions of the various molds are complete enough to serve as a guide for tool makers. As a matter of fact, the tool steel manufacturers have contributed data on their various grades of steel. The book includes a complete chapter on tool room nomenclature and answers the oft-repeated question: "What is the difference between hobbing and hubbing?"

A ready reference such as this is invaluable to anyone in the plastics field. If there are to be subsequent editions written and diagrammatic sketches of production molds, it would be indeed a worth-while addition.

George K. Scribner, president of Boonton Molding Co., and secretary of the Molders Section, The Society of the Plastics Industry, has written the introduction.

Lacquer and Synthetic Enamel Finishes

by Ray C. Martin

Published by D. Van Nostrand Co., Inc., 250 4th Ave., New York, 1940
Price $5.50 **526 pages**

The practical aspects of lacquers and synthetic enamels are emphasized in the five parts which make up this book. Part I treats of the history of the industry and the raw materials employed, including cellulose and resin bases, solvents, plasticizers, and pigments. Part II relates to plant equipment and typical formulations, and Part III is concerned with testing and trouble shooting. Part IV describes methods of application and particularly the finishing of furniture and automobiles. Part V is a 102-page glossary of paint, varnish, lacquer and allied terms. A practically complete lack of literature references and theoretical treatment of the subject is noticeable. The author obviously aimed to produce a service manual useful generally to producers and consumers of finishes. G. M. K.

★ FOR DESIGNERS AND ENGINEERS, CONTINENTAL-Diamond Fibre Co., Newark, Del., offers two valuable charts free of charge. One gives data on the four essential non-metallics. The reader can tell at a glance the dielectric strength, power factor, arc resistance, etc., of the material with which he is working. The other chart is an aid to measuring called the Decimal Equivalent Chart. It is 23 in. by 35 in. and gives decimal equivalents from $^1/_{64}$ in. to $^{61}/_{64}$ in. Free copies are available simply by writing to the company.

★ THE DEPARTMENT OF COMMERCE, BUREAU OF the Census, has released a 157-page report on Types of Operation for the Retail Trade: 1939. It presents statistics by types of stores (chains, independents, etc.) for each state and each city of more than 500,000 population, for selected kinds of business.

★ GEORGE GORTON MACHINE CO., RACINE, WIS., has just issued 2 new catalogs on machines which do outstanding work in the plastics field. They are the Gorton super-speed vertical milling machines and die and mold duplicators. The precision machines come in 3 sizes for tool, die, mold and production work. The booklet on duplicators discusses plastic molds, rubber molds, small drop forging dies, glass molds and duplicating die casting dies. Both are illustrated.

★ AMATEURS WILL WELCOME AN ATTRACTIVE catalog recently issued by Foredom Electric Co., 27 Park Place, New York, which pictures and discusses flexible shaft tools and accessories and how to use them, entitled, "*Portable Workshops.*" Also by Foredom is a 2-page booklet for the industry, illustrated with typical tools.

★ AN 8-PAGE BOOKLET CONTAINING DATA ON THE effects of Abalyn and Hercolyn, liquid esters of abietic acid, on the properties of blown asphalt has been issued by Hercules Powder Co., Wilmington, Delaware. The booklet contains tables on the fluidity of asphalt, its rate of penetration into asbestos and felt, and the changes in viscosity, flexibility, impact resistance, penetration values and susceptibility factors brought about by additions of the esters. Formulae of blends and graphs of the viscosity at 352 deg. F. and 450 deg. F. of the modified asphalt are included.

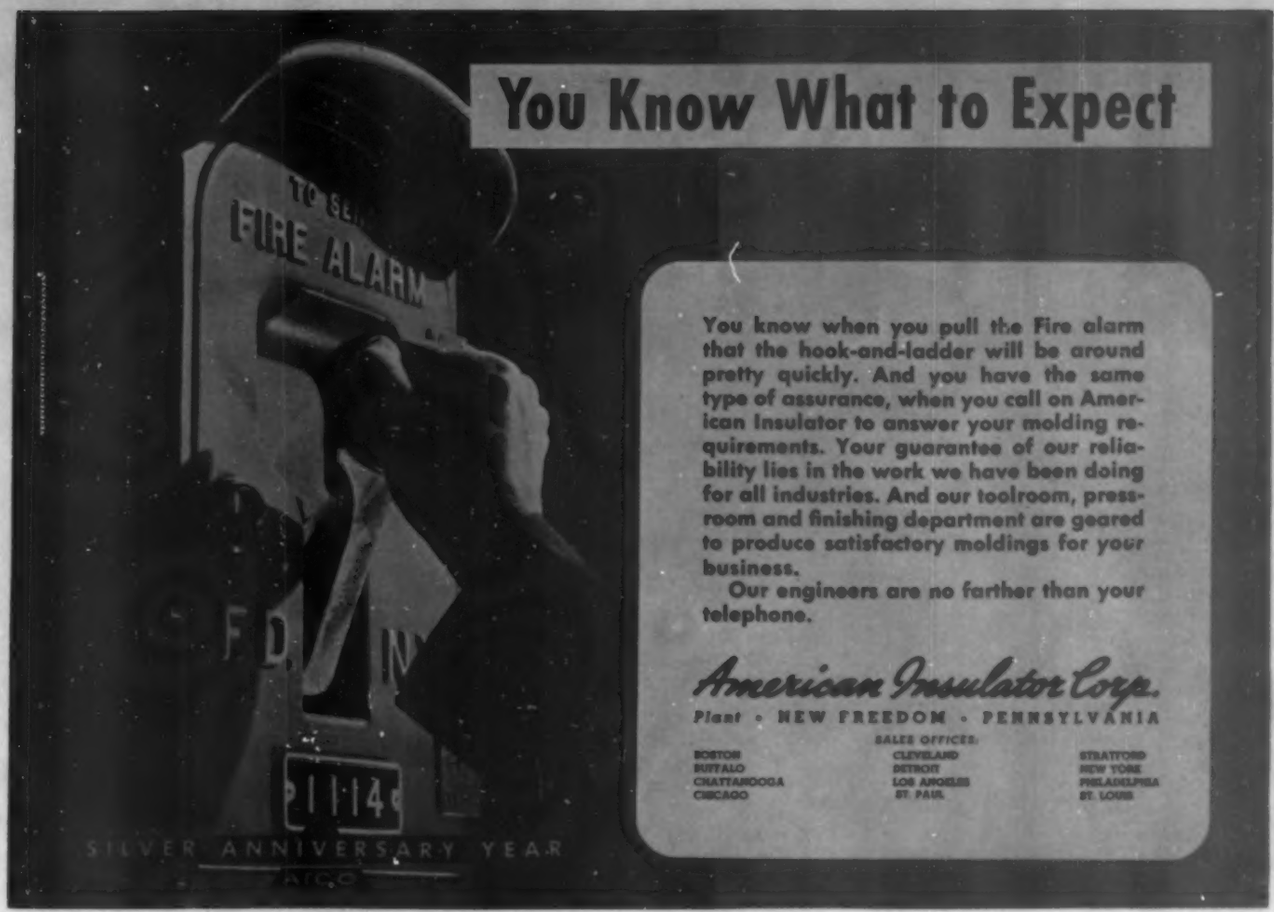
★ JOHNS-MANVILLE HAS JUST ISSUED A 44-PAGE booklet entitled "Packings." It is well illustrated with photographs and drawings stressing important points. Main topics are: Rod, Plunger and Valve Stem Packing; Molded Packing Cups, Clipper Seal Rings, Sheet Packing Gaskets and Gasketing Tape; Asbestos Wick and Rope, and How to Get Best Results from Packing.

★ A SURFACE GRINDER, 6 BY 18 IN., WIDELY USED in the plastics industry is one of the new machines pictured and discussed in the recent booklet by Norton Machine Co., Worcester, Mass. Grinding, lapping and superfinishing machines are fully described in the attractive 23-page publication.

★ RAYMOND PULVERIZER DIV., COMBUSTION ENGINeering Co., Inc., Chicago, Ill., have issued Bulletin No. 50 on Flash Drying System for the production of powdered materials. This system of drying and grinding simultaneously in a single machine offers the advantages, the bulletin states, of less handling of material, shorter time, saving of equipment costs and permits for an economical plant layout. Heat-sensitive materials are assured safe handling by Flash Drying without harming the product. The moisture always present in the mill system moderates the temperature of the circulating air and avoids scorching or discoloring the material during the process.

★ UNDER THE TITLE OF "*THE FURANS,*" THE TECHnical division of The Quaker Oats Co., Chicago, has brought out an informative little booklet. The industrial uses of furfural and something of the history are set forth in a clear, well-written 20-page brochure.

★ A 40-PAGE BULLETIN, SOUTHWARK-TATE-EMERY Testing Machines and Allied Equipment, has been published by Baldwin Southwark Div., Baldwin Locomotive Works, Philadelphia. The company's testing machines are illustrated with 50 photos and charts. Machine capacities range from 20,000 lbs. to 4,000,000 lbs. Photos show standard and special test setups on specimens and full sized structures. Subjects under test include airplane wing sections and engine mounts, riveted joints, gears, girders and concrete blocks. Second section of the bulletin is devoted to accessories including recorder, load maintainers and control apparatus.



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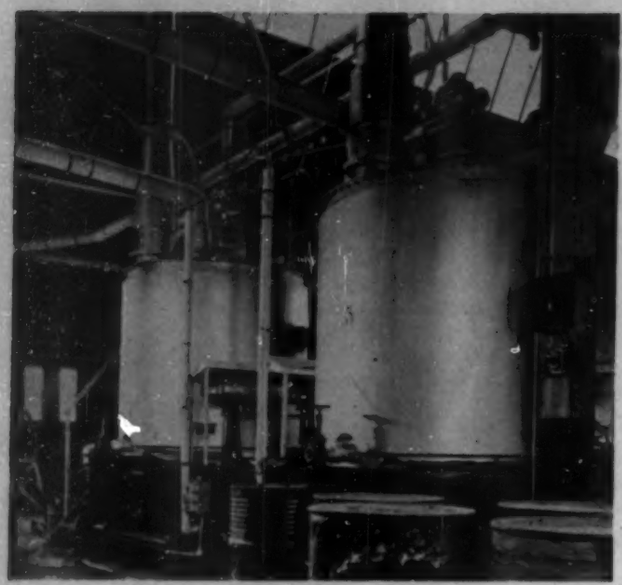

★ THESE 2 ADJUSTING TANKS (ABOVE) ARE PART of a group of 6 used for scaling purposes operating in a prominent varnishing plant. They are manufactured by the Brighton Copper Works. The tanks are equipped with explosion-proof motor driven agitators, and are block tin lined. Steel jackets are provided for heating and cooling. Other equipment made by the company includes distillation equipment, aluminum processing and storage tanks. The plant turns out stainless steel, copper, aluminum, brass, nickel, monel and all types of alloys in all sizes and types of equipment from pilot plants to large production setups.

★ MARVEL SAWS ARE BEING USED IN THE PLASTICS industry, manufactured by the Armstrong-Blum Co., for high speed and quantity production of pieces of lengths cut from bar stock. These high speed "automatic" saws come in 2 sizes: Marvel No. 6A, capacity 6 in. by 6 in., and No. 9A, capacity 10 in. by 10 in. They are heavy-duty, all ball-bearing sawing machines with automatic bar push-up, and require no more attention than an automatic screw machine, yet produce more pieces per hour, floor-to-floor, than any other cutting-off method.

★ THE BUTTONDEX CORP. ANNOUNCES THE INstallation of a new automatic button broach machine that features plastic buttons 12 to 34 ligne with 2 and 4 holes, as well as larger sizes. Its capacity is 300 to 450 buttons per minute.

★ PHOTOSWITCH PHOTOELECTRIC INSPECTION AND Registration Control Type A80 offers a simplified system for accurately controlling or inspecting cutting and printing operations on cellophane, paper, cloth, tin, metalfoil, etc. It is also used for detecting presence and absence of labels on cans and the proper location of labels on goods and other similar applications. All amplifying tubes are standard vacuum type and because of the simplified circuit and minimum number of parts, the control is rugged and low in cost. It is said to combine extreme sensitivity with high speed operation. It observes registration marks from penetration of light through transparent and translucent materials.

★ COMBUSTION TESTING INSTRUMENTS ARE BEcoming increasingly important today when fuel conservation is a topic of national interest. Hence the transparent plastic Visi-Draft; small, accurate draft gage manufactured by F. W. Dwyer Co., is of importance in the plastics field. Readings are taken from above making it possible to place the instrument on a table, floor or wherever most convenient. Location of the scale directly below and close to the indicating tube eliminates the possibility of error from parallax. Light source is from three sides providing high visibility under all conditions. The leveling bubble is set in a polished bore in the body of the gage where it is fully protected and visible from all angles. Level and zero scale adjustments are made simultaneously in a few seconds. With connection to the firebox or smoke pipe the gage will give a continuous indication of the draft and show the slightest change as adjustments are made.

★ H. O. SWOBODA, INC., HAS NEW FALCON ELECTRIC immersion type booster heaters for maintaining and increasing temperatures of a wide range of materials. These heaters are available in capacities ranging from 10 k.w. to as much as 1000 k.w. output. In many coating and saturating processes involving the use of heated asphalts, oils, paraffins, waxes, resins, creosote, varnishes, insulating varnishes, etc., it is necessary to increase or maintain temperature of the material by applying heat in the line between storage tank and the container where processing occurs.

★ FOR FASTER, CHEAPER DRYING AND HEATING processes, Westinghouse has brought out radiant heat drying lamps (above). An important application of these lamps for the plastics industry is as a dryer for injection molding and continuous extrusion materials. Ten lamps are used here to dehydrate acetate granules in many shades and tints preparatory to molding. The lamps are also used to soften thin plastic sheets for punching, to seal and to dry ink on cellophane and pliofilm bags and envelopes. The operation is said to take only 15 minutes, whereas the steam dryer required one hour. Lamps are also used for paint, ink, fabrics, fibre products, film, plastics and also to heat-treat metals. The infrared energy penetrates deep into the material and dries very rapidly.

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WANTED: Stainless Steel or Nickel Kettle, Vacuum Pan, Hydraulic Press, Preform Machine and Mixer. Reply Box 275, Modern Plastics. No Dealers.

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FOR SALE: 2—84″ Mixing Rolls; 10—Semi-Auto Presses, 75 to 400 tons, ejectors and pull backs; 4—Grould Triplex Hydraulic Pumps, 2—1500 PSI, 35 GPM, 2—3000 PSI, 18 GPM; 12—30″ x 40″ PLATEN, 500 ton Hydraulic Press, 1—W.S. 15″ x 18″ Hyd. Press, 9″ dia. ram, 4″ posts; 1—W.S. 24″ x 48″ Hyd. Press, 12″ dia. ram, with hyd. pushbacks; 1—46″ x 54″ Hyd. Press, 19″ dia. ram; 1—Thropp 36″ x 36″ 4-opening Hyd. Press, 12″ dia. ram; 2—Bethlehem 38″ x 78″ Hyd. Presses, with 20″ dia. rams; 1—Farrell two-cylinder vertical Hyd. Extrusion Press and Pump; Birm. 16 x 36 Mixing Rolls, silent chain 40 HP drive; 1—Farrell 14″ x 30″ Rubber Mill; 1—Allen 16″ x 42″ Rubber Mill; 7—W. & P. Mixers. 1—50 gal. Nickel Vac. Pan. Send for Complete List. Reply Box 446, Modern Plastics.

WANTED: Used Buffing Wheels. Will buy & pay cash for any quantity of used buffs from 6″ up. Submit sample. Manufacturer's Salvage Co., 507 Eddy St., Providence, R. I.

One Lupomatic Tumbling machine and one Lupomatic cut-off machine with 3 HP motor. Complete set of attachments for both machines. These machines have been used about three months. Make us an offer. Reply Box 455, Modern Plastics.

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FOR SALE: No. 1 Abbe Rotary Cutter, latest model, all internal parts highly polished, special improved hopper, high capacity production; brand new condition, only two months old, reasonable. Reply Box 457, Modern Plastics.

SURPLUS STOCK of heat resisting plastic door handles, drawer pulls, gas valve handles and lamp shades. Samples sent on request. Reply Box 458, Modern Plastics.

SALESMAN, having about 200 accounts department, chain and specialty stores in New York City, is seeking plastics line, preferably in dress accessories, ornaments, beads, etc. Commission or salary. Reply Box 459, Modern Plastics.

SALESMAN WANTED: We are looking for an experienced plastics salesman to offer our extruded product. Reply Box 460, Modern Plastics.

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Heating Element: 1800 Watts

Unit has five trays, 15″ × 22½″ each holding 10 lbs. of molding powder

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MODEL #2

Double Door Height: 50″ Width: 48″ Depth, 28½″

Heating Element: 3600 Watts Unit has 10 trays 15″ x 22½″ each holding 10 lbs. molding powder

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In the limelight

STRIPPED OF THE AURA OF MYSTERY WHICH HAS surrounded its growth, and with its jargon of chemical terms translated into everyday English, plastics, as an industry, made its bow before the people of Chicago during the weeks of June 19 to July 5. With its title, "A Salute to Man-Made Materials," the exposition unfolded on the sixth floor of The Fair store which "clocked" 8007 persons in attendance on the final day of the show.

Using as a nucleus "America's Modern Plastic Exposition," consisting of the prize-winning products in the annual competition held by MODERN PLASTICS magazine, Richard Flanagan, the publicity director of The Fair and sponsor of the Chicago show, solicited and incorporated exhibits of many other manufacturers of plastics totalling 10,000 items. A newspaper advertising and publicity campaign, a display window on world-famous State street, and eye-catching posters throughout the store were used to stimulate public interest. Officials of the store have expressed their complete satisfaction with the results of this "adventurous, unprecedented project." Acclaim in the press and day to day attendance by an intelligent, appreciative audience was no small yardstick of the signal success of the presentation.

Thus dramatically and factually were plastics brought to the people of Chicago. Without exaggeration and with a minimum of bally-hoo, the tens of thousands of visitors were brought to a realization of the wide scope of the plastics industry and its formula for better living.

★ STONE AND TUPPER, INC., STOCK AND CUSTOM manufacturers of plastics products, moved from 36 Tremain St., Leominster, Mass., to Flagg St., Clinton, Mass., July 1. They will occupy the entire building—20,000 square ft.

★ CALCO CHEMICAL DIVISION AND THE AMERICAN Cyanamid Co. have jointly occupied a new building at 3333 Wilkinson Blvd., Charlotte, N. C., especially designed for the needs of both. It is an air-conditioned building(below right) with 8600 sq. ft. of space which houses offices, laboratories (directly below) and warehouses. An interesting feature of the air-conditioning system is the separation of laboratory odors from other parts of the building. The American Cyanamid and Chemical Corp. centers its entire Southern district sales activities in this new office. The company manufactures chemicals for the South's growing paper industry, the vital Southern textile industries and a number of other important businesses located in the South. Located adjacent to the American Cyanamid and Chemical Corporation's Charlotte plant, this new office building provides closer coordination between plant and office activities.

★ REDUCTION IN THE PRICES OF FIRST GRADE Plexiglas sheets and extruded rods has been announced by the manufacturer, Rohm & Haas Co., Philadelphia. The reduction in sheet prices, ranging from 15c to 25c per square foot, was retroactive to May 1. The lower rod prices went into effect June 1. Both price reductions were made possible by recent improvements in manufacturing methods and by the increased production the company has undertaken to keep pace with the demand for acrylic sheets for nose sections, gun turrets and similar transparent sections of modern military planes.

★ AT A RECENT MEETING OF THE BOARD OF DIRECtors of Peerless Roll Leaf Co., the following officers were elected: W. F. Grupe, chairman of the board; C. A. Lydecker, president; A. M. Wickwire, vice president and treasurer; and W. J. Boyd, vice president and secretary.

★ PLASTIC MOLDED ARTS, INC., ANNOUNCES THE removal of its offices and factory to new and larger quarters at 12-04 44th Ave., Long Island City.

★CATALIN CORP., 1 PARK AVE., N. Y., PRODUCERS OF cast phenolic resins, announces the introduction of a new "Polystyrene" molding compound to be marketed under the tradename "Loalin."

Production is now in progress and a new building is being completed adjacent to the company's present plant at Fords, N. J., which will be devoted entirely to the manufacture of this latest addition to Catalin's growing family of cast, liquid and technical-cast resins.

"Loalin" is the result of several years of research in the Catalin laboratories and the manufacturer will be glad to send specifications and full details to any interested molder.

★ IRVING L. RABB ANNOUNCES THE FORMATION OF his own company, Wright Plastics, Inc., 521 Fifth Ave., New York, specialists in injection molding for the trade. Mr. Rabb was formerly in charge of purchasing and production for Dura Plastics, Incorporated.

(Please turn to next page)

The new air-conditioned building (above) houses offices and laboratories of Calco Chemical Div. and American Cyanamid Co. next to their Charlotteville plant. The huge, completely equipped textile laboratory is pictured at left

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The present complete line of plastics extruding machines (of which one type is shown below) continues in favor, the demand being sufficient to tax our production facilities. From all points of view—design, materials, construction—they are the finest money can buy.

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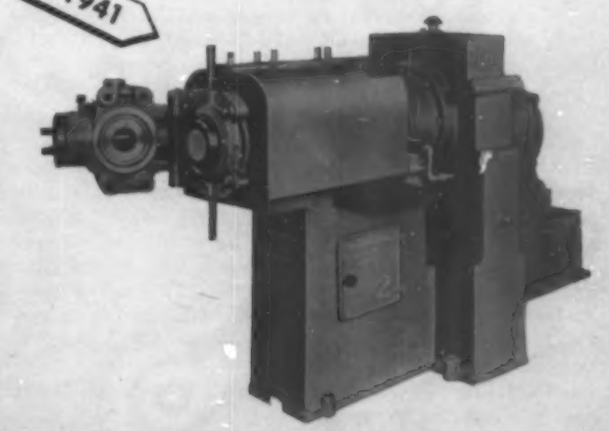
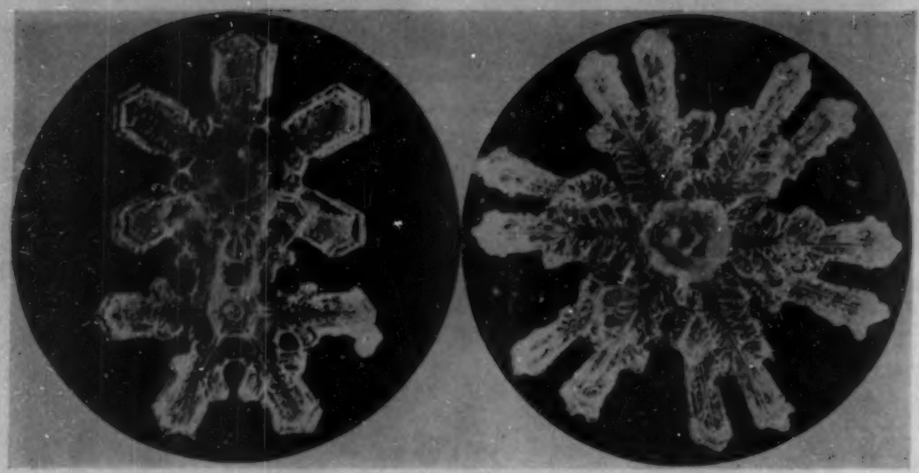




Two snowflakes, permanently preserved in transparent polyvinyl formal resin, are frozen into a pattern of rare beauty, as revealed under the microscope. Unique specimens, breath patterns and other perishable formulations are similarly preserved in the plastic film

★ THE BEAUTY OF THE CRYSTAL PURE SNOWFLAKE is now permanently preserved due to a simple method of covering the snowflake with a drop of Formvar, a transparent plastic resin used for electric insulation, and allowing the drop to dry.

This process has been worked out by Vincent J. Schaefer of the General Electric Research Laboratory who found that the plastic made a permanent cast. Though the film remaining is only about eight-one hundred thousandths of an inch in thickness, he reported, it preserves the characteristic hexagonal snowflake features in the most microscopic detail for later photographing or microscopic study. No two snowflakes are ever exactly alike.

The only essential equipment necessary for preserving snowflakes is a strip of velvet, or other dark material, a few glass microscope slides, a toothpick or wire and a weak solution of a suitable resin. And, of course, an occasional flurry of snow.

As soon as a suitable flake is observed in the dark background a drop of the solution is placed on the glass slide with the toothpick or wire, and the flake is lifted with the same tool and placed in contact with the drop. The solution must wet the flake completely. A second drop placed on the snowflake is sometimes desirable, particularly if the flake is of large proportions. After wetting the flake in this manner the solvent soon evaporates, leaving the snowflake encased within a shell of resin.

It was found that the best results were obtained from a one percent solution of polyvinyl formal resin, dissolved in ethylene dichloride and cooled below freezing. The thickness of such a replica is of the order of 20,000 Angstrom units.

As soon as the solvent has evaporated, the slides may be removed to a warm place. The case may be protected from abrasion by covering with a transparent sheet of resin or a glass coverslip or slide. The casting materials can be carried anywhere, thus greatly increasing possibilities of obtaining unique specimens.

A slight modification of the method provides an equally easy way to make a permanent record of breath patterns and any other structures, such as frost crystals, hoar frost and similar perishable formations.

After the molecular films are deposited on the plate, it is placed in the freezing compartment of a refrigerator, and upon cooling to about 10 deg. C., is held for a brief moment in the presence of moist air (which forms the so-called "breath patterns"), replaced in the ice chamber and the breath pattern is frozen. Meanwhile the one percent solution is cooled below freezing. The plate containing the frozen breath pattern is then dipped into the solution, removed and returned to the cold chamber until the solvent evaporates. A perfect replica of the breath pattern remains after the plate is warmed and the water evaporates.

★ R. H. FREITAG CO., AKRON, OHIO, MANUFACTURER of tools and dies, has recently built a 300 ft. by 50 ft. addition to their plant for the exclusive manufacture of plastics molds.

★ L. T. BARNETTE, FORMERLY ASSOCIATED WITH the Thermo plastics div., Standard Products Co., St. Clair, Mich., has accepted the important post of correlating and assisting various governmental divisions in the plastics substitution program for national defense work in Washington, D. C. Announcement was made of his appointment by the office of Production Management, Ordnance Section.

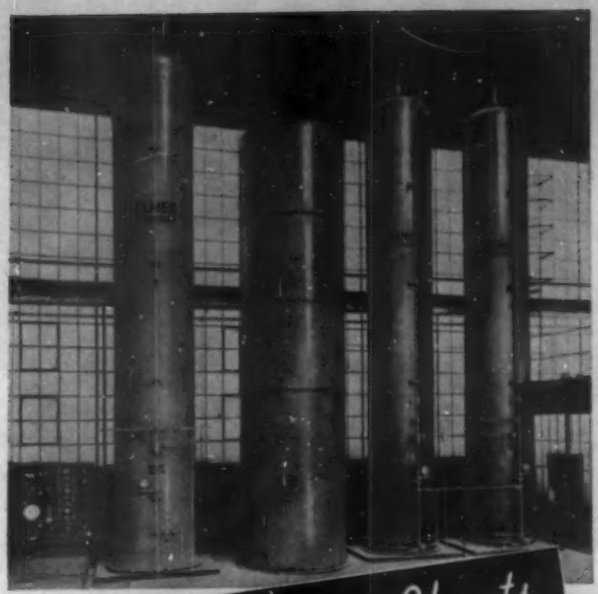
★ BAKELITE CORP., UNIT OF UNION CARBIDE AND Carbon Corp., announces the following additions to its Research and Development Laboratories at Bloomfield, N. J.: William A. Brandenburg, Jr., B.S. in Chemistry from Albright College; Dr. Frank M. Rugg, B.S. in Physics, Mississippi College, M.S. in Physics, Louisiana State University, and Ph.D. in Chemistry from the University of Illinois; John M. Whelan, Jr., M.E. degree from the Stevens Institute of Technology; Lawrence E. Welch, M.S., S.B. from Massachusetts Institute of Technology, 1941; Dr. Alfred G. Farnham, B.S. in Chemistry, Monmouth College, 1937, M.S. and Ph.D., State University of Iowa, 1939.

★ GEORGES WILMET, INC., INDUSTRIAL ART COUNsel, announces the removal of its offices to Beaux Arts Studio Building, 80 East 40th St., New York.

★ CORNERSTONE OF THE NEW $675,000 BOILER House was laid at the Tacony, Philadelphia, plant of Henry Disston and Sons, Inc., recently. Another ceremony which followed directly was the dedication of the new U. S. A. Philadelphia Armor Plate Plant. The plant was built and equipped by the Quartermaster and Ordnance Departments of the U. S. Army with the Disston firm acting as consulting engineers. The company has been an authority on the production of light armor plate since the time of World War No. 1.

★ PLASTIX TRIM CORP., 402 MT. VERNON AVE., Columbus, Ohio, has gone into the production of extrusion of plastic materials.

★ F. H. TUPPER HAS RECENTLY BEEN APPOINTED BY the U. S. War Department as an expert on plastics in the Office of the Quartermaster General. He will be concerned for the present with a study of the specifications of quartermaster supplies and equipment to determine where plastics or other materials may best be used to replace certain critical and strategic metals such as aluminum, zinc, bronze, etc. That office is in agreement with the Office of Production Management to the effect that plastics can no longer be considered as one substitute material, but as many, and that as such, they are a group of industrial materials which stand on its own feet. Mr. Tupper's most recent association was with the Vulcanized Fibre Co. as supervisor of production in the injection molding department. *(Please turn to page 96)*



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Odor-taste test of closures

(Continued from page 65)

4. Phenol is lost in the evaporation of alkaline sodium hydroxide solution, thus indicating that a procedure which eliminates ethyl alcohol is desirable.

On the basis of these various tests, it was decided that the bromination test was the most practical. It was also found advisable to remove the liners from the caps before testing, because the tannic acid from the cork interferes slightly with the test. A test for mold or glue odor was set up separately to check the quality of liners used in the caps.

Test procedure

Four short-skirt caps (see Fig. 2) with liners removed are placed in a chemically resistant glass-stoppered bottle and covered with 100 ml. of distilled water at 75 deg. C. In the case of the long-skirt type, four caps with liners removed are placed in a glass-stoppered bottle and covered with 200 ml. of distilled water at 75 deg. C. A strip of moist, red litmus paper is suspended from the inside of the ground-glass joint so that it is in contact with the vapor from the liquid.

Fig. 2—Various sizes of plastic closures.

The prepared sample is placed in a water bath or oven at 75 ± 1 deg. C., and maintained at that temperature for exactly 4 hrs. The preparation is swirled occasionally to mix the solution and to dislodge air bubbles from the caps. At the same time it is noted whether or not the strip of litmus paper turns blue. A change in the color of the litmus paper indicates the presence of ammonia.

The sample is cooled to room temperature in one-half hour, shaken thoroughly and 25 ml. of the solution pipetted into an iodine flask. Twenty-five milliliters of distilled water is placed in a similar flask for a blank. To each container 10.0 ml. of 0.1 *N* KBr–$KBrO_3$ solution and then 3 ml. of HCl (1:1) are added and the bottles are stoppered quickly. The blank must be run in the same way and at nearly the same time as the unknown samples as is possible.

If a heavy, white precipitate of bromophenol appears upon addition of the HCl, it indicates that phenol content is high. Should bromine color disappear entirely, it is necessary to add 10.0 ml. of additional bromate solution. The samples are allowed to stand for 10 min. and then 5 ml. of freshly prepared KI solution (10 percent) are added carefully. No bromine must escape. The KI solution is placed around the stopper in the funnel neck flask, the stopper is raised slowly, the KI is washed into the flask and the stopper is replaced. In case no iodine flasks are available, the following alternative method has been found to give satisfactory results: The bromination is carried out in a 100- to 250-ml. glass-stoppered container. Before adding the KI solution, the glass stopper and neck of the container are washed down as the stopper is removed, and a funnel is quickly inserted into the neck. The KI solution is added quickly, both the inside and outside of the funnel stem are washed down immediately and the stopper is replaced.

The iodine which has been released by the bromine is titrated with 0.1 *N* sodium thiosulfate. When only a faint brown color persists, about 1 ml. of starch solution (1 percent) is added, and the titration is continued until the blue color disappears.

Calculation of the phenol per standard surface:

$$W = (A - B)N \times 31.34$$

Where:

- W = milligrams of phenol per standard surface,
- A = milliliters of sodium thiosulfate required to titrate blank,
- B = milliliters of sodium thiosulfate required to titrate solution,
- N = normality of sodium thiosulfate.

NOTE.—A standard cap surface is defined as the surface of one long-skirt cap. A short-skirt cap has one-half of a standard surface, and a miniature cap has one-fourth of a standard surface.

Solutions:

Standard 0.1 N Bromate.—Dissolve 2.784 g. of $KBrO_3$ and 10 g. of KBr in distilled water and dilute to 1 liter.

Standard 0.1 N Thiosulfate.—Dissolve 25 g. of $Na_2S_2O_3.5H_2O$ in previously boiled distilled water and dilute to 1 liter.

Standardize against 0.1 *N* $KBrO_3$ solution.

Hydrochloric Acid (1:1).—Mix equal portions of HCl (sp. gr. 1.19) and distilled water.

Potassium Iodide (10 percent).—Dissolve 10 g. of KI in 100 ml. of previously boiled distilled water.

Starch Indicator.—Dissolve 1 g. of soluble starch in 100 ml. of boiling water.

Duplicate determinations on separate sample preparations should check within 0.5 mg. of phenol per standard surface.

Loss of bromine is a common source of error in the determination. A blank run in exactly the same manner as the unknowns will help to minimize this error. Free phenol can be easily washed off the surface of the caps with water, and care should be taken to see that the only water which comes in contact with the caps is that used in the test.

Odor-taste test

Samples taken from 33 shipments of phenol-formaldehyde plastic closures, as received from the manufacturer, were analyzed for free phenol by the method given, and

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duplicates were forwarded to our Quality Laboratory[1] with their identities indicated by code numbers only. Here they were studied by the employment of the standard difference-preference procedure. This technique is very delicate and involves color, amount, temperature and time control. The results accruing from the odor and taste experiments were treated statistically. At the completion of both the chemical and odor-taste studies, the two sets of results were plotted as shown in Fig. 1. It will be noticed that while the phenol results and those from the odor-taste tests are not perfectly covariant, nevertheless the trend is unmistakable. A calculated correlation reveals that the two sets of results obtained are related to the extent of 0.64 with a probable error of ± 0.09.

On the basis of these results, it was possible to advance chemical specifications for phenol-formaldehyde plastic closures as regards the odor-taste contamination tendencies of such caps.

[1] The odor-taste tests and correlation calculation were made by our Quality Laboratory, under the direction of E. H. Scofield.

What's in a vacuum?

(*Continued from page 42*) be done unless proper wall thickness has been provided to prevent cracking when the parts are pressed into the drilled hole.

Strengthening ribs and bosses can be used to advantage on every design. Care must be taken to provide thick spots where impact blows are to be received. A short study of the design and the use of the product in the field to indicate where the blows are to be expected in normal use is particularly helpful in planning design for such parts. At the point where the strong blows are to be expected an increase in the wall thickness will generally provide sufficient strength to take the impact blows without harm. A thin rib is a poor substitute for a thick section that is expected to receive impact blows. Molded materials are generally weak in tension, and a thin rib invites a crack which, once started, will crack on through the heaviest sections. Ribs are properly used as compression members and should then be of generous proportions. The joining of two molded surfaces must always have large radii because a sharp corner is an invitation for a crack to start. Often the crack starts before the machine is assembled. There are cases on record where a sharp corner has caused more scrap on shipment of parts to the assembly line, than failure of parts on the machine in service.

Should there be no need to add bosses or ribs for strength, the material should be rather thin and allowed to bend when stressed. This thin material, when bent, will relieve the tension or compression in other adjoining sections of the molding and will act as a shock absorber if the thin walls do not strike any other part of the machine. Another way of bracing a molded section for impact strength is to add an internal bracing member into the regular wall itself. This internal bracing will not show, as the brace may be a flat sheet or a length of tubing made of canvas-laminated phenolic placed right into the mold as a floating insert.

Usually it is better to provide bosses for impact areas, ribs for compression members and to give special consideration to areas of extreme vibration of impact.

In conclusion, it is thought by the writer, that if a few of the ideas expressed above are kept in mind much of the molded designing trouble will be eliminated. The right material, the proper assembly, the selection of the proper wall thicknesses, the sparing use of inserts, and attention to impact ribs and bosses, all these points must be considered in choosing a good plastic design for most vacuum cleaner parts.

Credits: Material and Molding by Bryant Electric Co. for Westinghouse Electric & Mfg. Company

Reinforcement with sisal

(*Continued from page 64*) rial. The composition is likewise capable of use as a molding material of unique quality. It lacks the great adaptability to complex shapes of molding compounds, but is superior to paper and fabric, being nearly equal to macerated cloth. Within the range of shapes possible, much lower molding pressures are required than with other high-impact materials. The bulk factor is appreciably lower, and, fully as important, the coherence of the needled web is such that flash molds are suitable. Charges may be measured readily by selection of precut shapes; combinations of shapes can be assembled and stabilized for added convenience.

Most of the advantages of this filler flow from its typically foraminous, yet stable structure. The easy penetration of resinous solutions has been cited; another consequence is a marked receptivity for powdered substances. These may be used to modify the character of the finished articles. Examples include coloring pigments, auxiliary fillers which will either diminish or improve conductivity (heat, electrical, X-ray), dry lubricants, bullet arresters, and simple weighters. It is possible even to introduce resins in dry powdered form. Especially high impact resistance is attained by this technique. None of these conveniences is exclusive property of the sisal filler, but the use of sisal is stressed because its combined strength, stamina, and economy have invited most development. Other fibers such as manila and jute are available for special requirements.

Applications

Sheets and molded shapes are produced. These find use where high impact is needed. Cams and gears, bobbin heads, bearings, tension and compression members, abrasive disk hubs and backs, bumper parts, and electrical assemblies have been developed. The material is obtainable in molded and sheet form, or as a composition ready for curing and pressing.

Trade names—*Corolite, Corofelt.*

CONTINUOUS *Extruding of* PLASTICS

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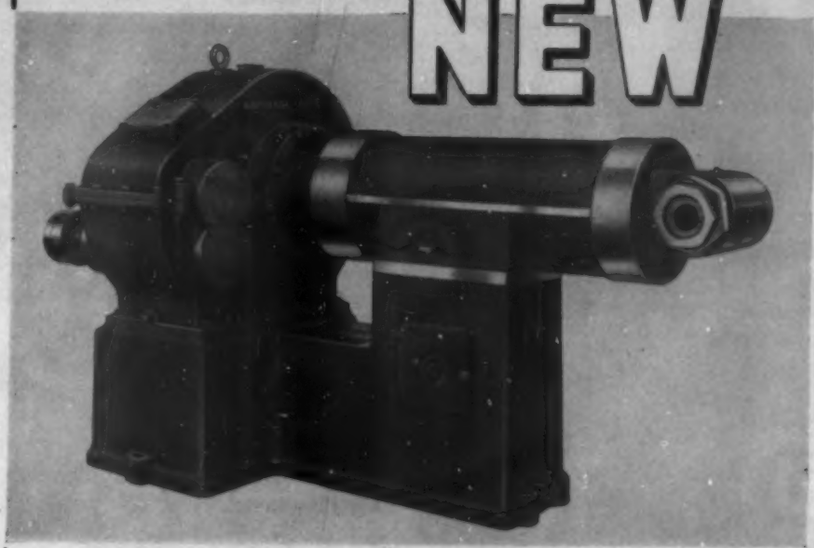

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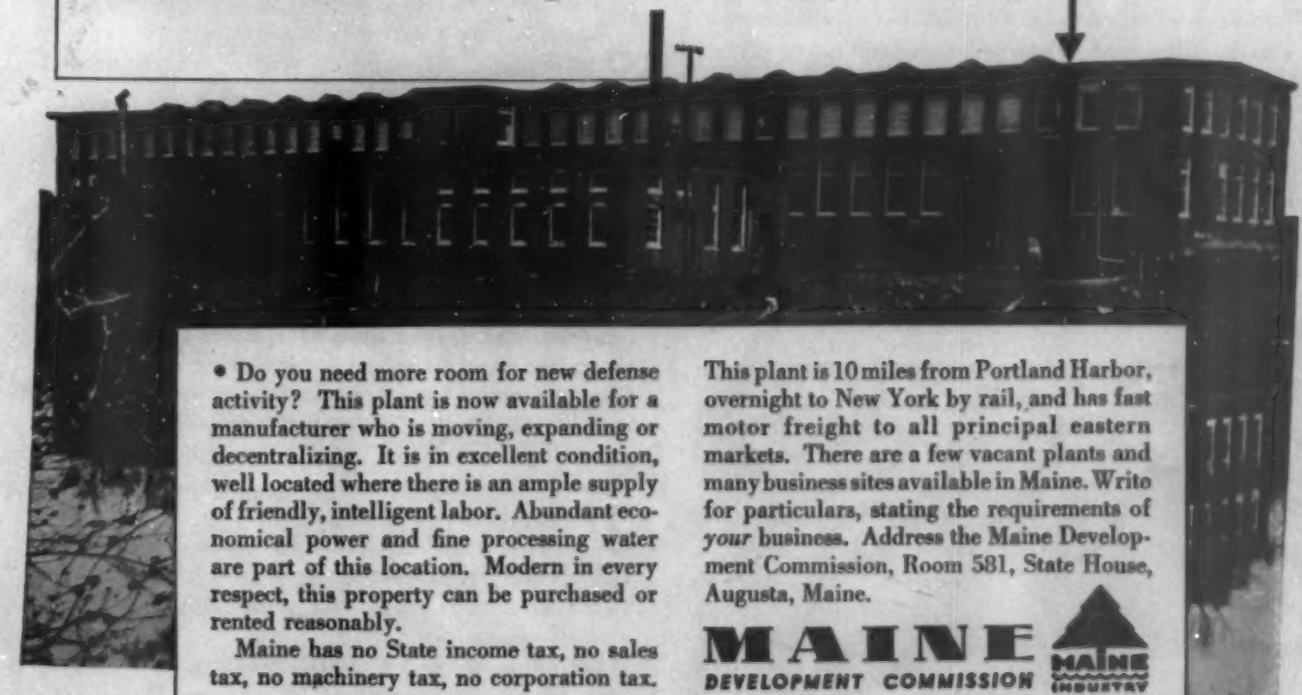

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MAINE
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Blackout truck lights

(*Continued from page 34*)

The rectangle (Fig. 1) is milled by moving the table transversely until the center of the rotary head coincides with the center line of the rectangle. A $^7/_8$ in. end mill is then used to rough mill this cavity to the proper depth. The longitudinal table feed is engaged for the proper distance equivalent to the length of the rough-milled cavity. The finishing operation on this rectangular cavity is completed by using a $^1/_4$ in. end mill. For this operation the rotary head center is located over the longitudinal center line of the rectangle, by moving the table with the precision feed screws. The cross slide is then offset an amount equal to one-half the width of the rectangle minus the radius of the cutter; and thus the finishing cut is taken. With a slotting and cornering attachment the corners are squared.

The milling of the trapezoid-shaped cavity (Fig. 3) is easily accomplished by setting the rotary head at the angle *m-l-j* and with the cutter at *l* it is fed along the line *l-j* by means of the spindle cross slide. The spindle is then brought back to the zero on the cross slide scale, thus returning the cutter to *l*. The table is now fed longitudinally along the line *l-m* and for a distance equal to *l-m* minus twice the radius of the cutter. The head is now revolved through the angle *l-m-k* and again the cutter is fed along the line *m-k* by means of the spindle cross slide for a distance equal to *m-k*, minus twice the radius of the cutter, which is the same dial reading as for *L-J*. The table is now moved longitudinally for a distance equal to *k-j*, minus twice the radius of the cutter. The trapezoid-shaped cavity has now been outlined and milling of remaining portion is accomplished.

The milling of the ellipse (Fig. 3) follows the same fundamental operation as for the milling of the cavity in Fig. 1. The head is moved to one additional center, namely, that at O^1 and the spindle offset to a radius equal to O^1H as shown. Thus the arc on the lower half of this somewhat irregular ellipse is milled.

The completed mold for the plastic tail light assembly is illustrated in Fig. 6. Obviously, the procedure for the milling of the cavities in these molds calls for fundamentally the same operations as those in Figs. 2 and 3.

The readings for the various operations necessary to mill one cavity are noted and then repeated for the remaining cavities. The operations are progressive in the sense that when an operation for one cavity is completed, it is immediately reproduced in the other three. Thus referring back to Fig. 2 when the arc, whose radius is *O3-L* has been milled, this same arc is milled in the other three figures. The table is moved so that the center *O3* is repeated for the upper right-hand cavity. A transverse movement of the table brings the center of the rotary head below the center line *a-b*, a distance equal to the distance between *m-n* and *a-b*. This can be repeated for all the operations since the four cavities are equally spaced from both the horizontal and vertical center lines, namely, *a-b* and *c-d*.

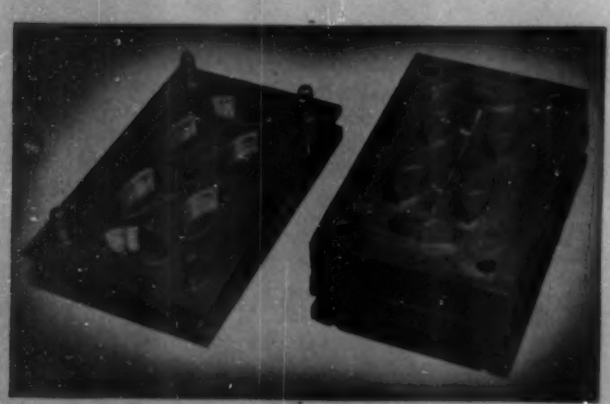
Hence the center lines, both horizontal and vertical, are the datum lines from which all table and rotary head movements are made. Thus all operations are performed with one setting of the work piece. Moreover no layout is necessary, and no measurements need be taken other than those that can be read off the graduated dials and scales.

A cherrying attachment makes possible the milling of geometrically shaped cavities in the vertical plane, as is possible with the rotary head in the horizontal plane. In the dies for head and tail light filters, the cherrying attachment was not used. The cavities are all milled regularly by sinking the end mill to the required depth.

Plastics are playing an increasingly important role in national defense. This is possible not only because of the advancement in the plastic field, but also because of those that have been made available in the tool and die milling phase of this work. The articles that follow in this series will indicate how plastics are playing their part in this emergency because of the latest developments in the making of plastic molds.

Credits: Lucile; Tenile. Molds and plastic castings, products of the Central Die Casting Co. Front and rear lighting units for U. S. Army trucks, design of Guide Lamp Division, General Motors Corp. Equipment by Kearney & Trecker Corporation.

6—Completed six-cavity mold for the plastic tail light assembly used on army trucks for night maneuvers



Filing molded parts

(*Continued from page 48*) possible. In order to minimize the tendency for the plastic material particularly the softer types to collect in or to clog up the teeth, files for plastics have wider and more rounded gullets than regular files and the rake of the teeth is such as to permit easy clearing of chips. To further reduce the tendency for filings to collect on the file, plastic files are usually furnished having a dry finish. The common shapes of files such as Flats, Mill files, Half Rounds, Rounds and Squares, etc., will meet most of the requirements as regards shape but many other shapes are available if required.

For finishing molded plastics where finish is important, relatively fine single cut files are used, and in some cases fine double cut files. Mill files in the Bastard cut

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or coarser are used extensively. The so-called Button files are also employed, these files being made from steel of flat or mill section, single cut on both sides from the ends towards the center so they can be reversed when one end has been worn out. Such files generally are somewhat coarser than Mill files and the teeth are specially designed for filing plastics.

For filing the softer plastics, especially the acetates, coarse files should be used wherever possible as this material generally is removed in shredded form when it is filed. Since it is soft it has a tendency to collect and become wedged in the teeth, especially in the case of the finer cut files, which affects the cutting ability of the file. Sometimes it is possible when filing these soft plastics to use coarse single cut files with approximately 14 or 16 teeth per inch. These files when used with a draw-filing motion have less tendency to fill up than the finer cut files and will leave a fairly good finish. If the clogging of the files is serious enough so that it is difficult to use them satisfactorily, knives or scrapers are sometimes used on the softer plastics.

The purpose of most of the filing on plastics is to remove the light flash resulting from the molding operation. Files should be used with a rapid, light sweeping stroke. Generally the flash to be removed is light and this can generally be accomplished with light pressure which at the same time prevents the file from cutting too fast which would increase the tendency for the file to become clogged up. Half Round files, usually in the smaller sizes are used for removing the flash and smoothing up rough places on concave surfaces. Round or Half Round files are used for cleaning out holes or rounded slots. Single cut files are used when a good finish is necessary and where the file can be used with a sweeping stroke as along the edge or corner of a molded part. For straight filing and where finish is not important, double cut files are used. In the American Pattern files the finer cuts such as 2nd Cut or Smooth files are used and if Swiss Pattern files are used the Nos. 0, 1 and 2 cuts are commonly used.

For best results in all cases the selection of the proper file depends on the size of the piece, the shape or contour of the surface to be filed and the finish desired.

Evaluation of resinous flow

(*Continued from page 61*) tive value (deceleration). In this phase the forces tending to stop flow are in greatest evidence. The three dimensional macromolecules begin to and finally exhibit internal forces sufficient to offset the deforming forces. The steeper the slope in this phase the more quickly the cure occurs.

Experimental results

The experiments performed determined the effect on the flow of a phenolic molding composition due to singly varying the following factors:

Expt. 1 Pelleting time.
Expt. 2 Pelleting temperature.
Expt. 3 Pelleting pressure.
Expt. 4 Height/width ratio of the pellets.
Expt. 5 Moisture content of the pellets.
Expt. 6 Preheating of the pellets.

The test data for each set of experiments are presented in Table I and are illustrated in accompanying figures designated by the same number as the experiment. The (a) figure contains the height vs. time plot and the (b) figure is the plot of log dh/dt vs. log h. The (c) figure is a plot of the velocity of flow in phase B and the value of n, the cure criterion in phase C, against the individual variables.

Discussion of results

Before discussing the results it is well to insert a word of caution. Most of these results can be applied in general; however, the specific conclusions are drawn only to the powder studied. Since powders vary widely, discretion must be used in drawing analogies.

(1) Increasing the pelleting time from 30 seconds to 3 minutes has practically no effect on the subsequent flow and cure of the pellets.

(2) The pelleting temperature series demonstrates the quicker curing of pellets made at higher temperatures. The value of n, the deceleration in phase C, becomes numerically higher, while the velocity of flow dh/dt, in phase B where the greatest flow occurs, decreases as the pelleting temperature increases. The increase in cure rate is probably due to better heat transfer and advancement of the resin. The flow in turn should decrease as the molecular complexity of the resin increases.

(3) Doubling the pressure of pelleting had no effect on the velocity of flow in phase B. The value of n in phase C indicates only a slight increase in curing rate for the pellets made at higher pressures.

(4) Increasing the initial pellet height from 350 mils to 550 mils had little effect on the flow relations. The effect of presenting more material to the same deforming force is noted by a slight downward trend of both dh/dt in phase B and n in phase C.

(5) The effect of moisture content on the flow was quite pronounced. The pellets of high moisture content flowed much faster in phase B and cured more quickly in phase C than those of lower moisture content. The effect is probably a combination of lubricating action and better heat transfer.

(6) The effect on the flow, of preheating the pellet between the plates just before flow, was also pronounced. The greater heat content and molecular advancement attained resulted in extremely high curing rates in phase C; velocities of flow in phase B.

Conclusion

The parallel plate method has been demonstrated to measure the effect of numerous variables on the flow

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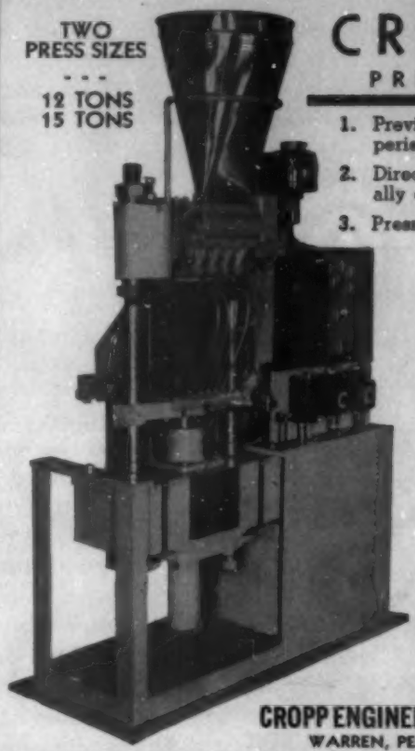

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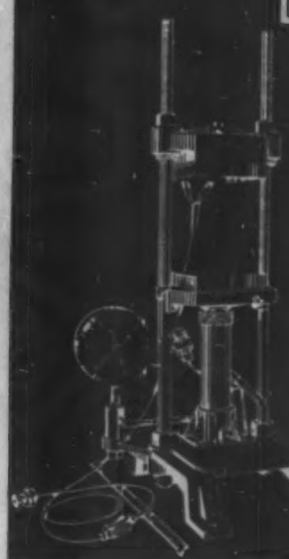

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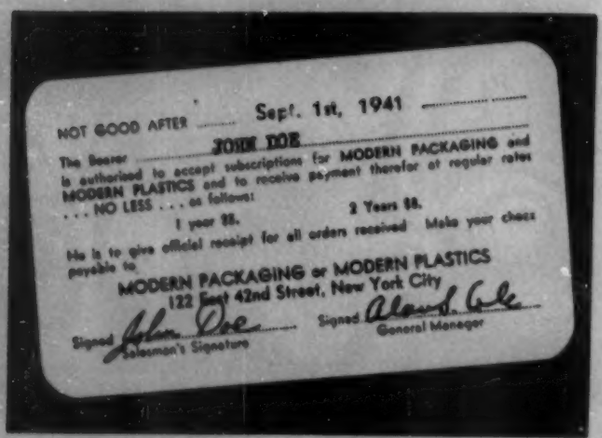
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Arc-proof limiter shells

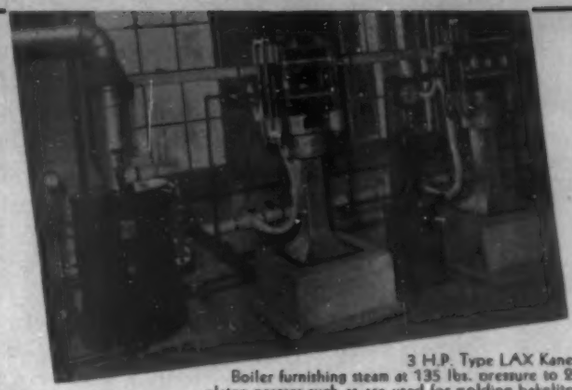
(*Continued from page 39*)

and, therefore, only small batches can be made up at any one time and a batch must be used up in the press within half an hour or so after mixing. Otherwise the composition begins to harden and becomes useless. If several presses are engaged in the pressing operation, a battery of small mixers must be kept close at hand and running constantly to keep up with the press production.

Because of the nature of the mix the proper amount of material required for an individual pressing must be hand weighed. Proper spread or packing of the composition in the mold is essential to best results. After pressing, steps must be taken to prevent air drying of the cement which constitutes the binder. Otherwise this material, which hardens like concrete, will be defective in strength. The cure is completed by immersion in water for several days, the exact time being determined by the size of the piece and the thickness of the various sections. When fully cured the molded parts are removed from the watertanks and dehydrated, after which they may be finished with wire brushing and ground if necessary to meet close tolerances.

In most of the applications of limiter shells, the units are completely assembled and covered with rubber. In some cases, such as limiter lug shells, which are generally installed in electrical distribution centers of large factories and commercial establishments, it is necessary to coat the shells with a moisture resisting resinous compound since the shells without such a coating absorb moisture to approximately 10 percent by weight. For commercial purposes other than limiter shells, the cold molded plastic parts are generally boiled in wax which impregnates the material and reduces the moisture absorption to as low as 1 percent or sometimes less.

Successful operation of the simple limiter design as illustrated by the single 4/0 size straight type requiring two interlocking cold molded plastic shells as a protective covering, encouraged Consolidated Edison's engineers to extend the use of similar equipment to those parts of the system where larger cables are installed. Later more complex designs of multiple fused connections known as crab joints are used. As many as four cables are connected inside of a cold molded plastic housing. This is honeycombed with tracks for



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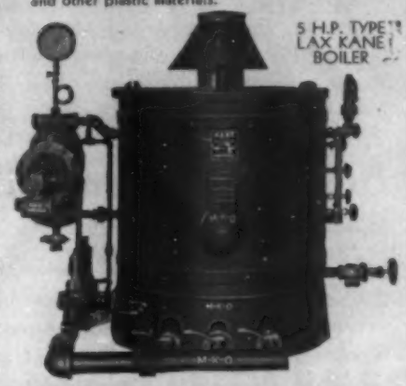

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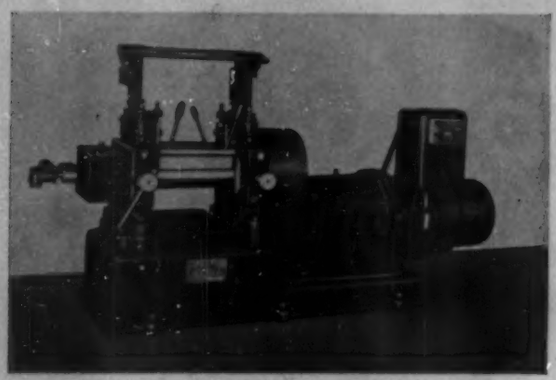

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the current carrying copper parts with explosion chambers surrounding the fusible elements. It is necessary to have so tight a fit in the assembly of some of these crab joints that the molded parts are simultaneously surface ground in pairs on the same machine and are kept in pairs until assembled. A discrepancy in thickness between the two pieces of even ten-thousandths of an inch would prevent the proper application of the insulation to the crab joint.

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Credits: Hemit by Garfield Mfg. Co. Engineering by C. P. Xenis and E. Williams, Consolidated Edison Co. of New York.

New light on an old problem

(Continued from page 49)

In his investigation of low-income group housing projects, Nelbach found one case in which a family of seven living in a recently completed project in the New York metropolitan area, had no artificial lighting of any kind although the United States Housing Authority minimum specifications call for "convenience outlets as required by the local code." Provision was not made for central ceiling outlets or other sockets.

Convinced of the necessity for providing adequate lighting facilities, the technical director worked with such authorities in the lighting field as Stanley McCandless, Professor of Lighting at Yale University School of Drama, and Maurice Surface of the Lighting Division of Chase Brass and Copper Co. They decided jointly on 16-in. translucent molded ivory urea plastic reflectors for living rooms and a 12-in. urea bowl for all bedrooms. This was for the Elm Haven project which comprises 487 dwelling units and Quinnipiac Terrace having 248 dwelling units. Central ceiling lighting fixtures were provided for all principal rooms—over 1450 plastic reflectors for these rooms alone.

Plans also call for a specially designed floor lamp with a molded plastic reflector as the standard lighting equipment for living rooms in Farnam Court, the third housing project now under construction in one of the most congested areas of the city. Plastic ceiling units will also be used in the bedrooms in place of the central ceiling unit. Mr. Nelbach and his associates have specified an I.E.S.-type floor lamp of molded urea with a plastic reflector bowl. It is of special design and sturdy construction with a weighted base. The bowl is of urea-formaldehyde, lightweight and non-shatterable to eliminate top-heaviness. Because of their good design and general appearance they will contribute to the home furnishings of the apartment.

It is expected that the total housing project for New Haven will involve an expenditure of $6,000,000 of which $5,500,000, or 90 percent, is obtained by the sale of first mortgage bonds to the United States Housing

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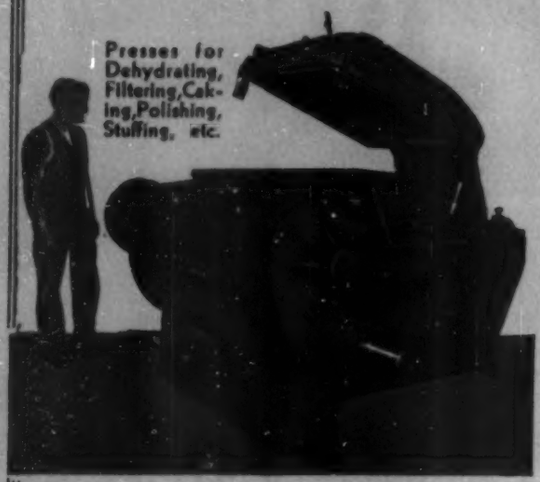
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In discussing his reasons for the use of translucent plastic bowls, Nelbach said that the design appeared the most advanced from the standpoint of efficiency because they cast a minimum of shadows, gave a soft, glareless light and the color selections of warm ivory shades were good. The safety factor of the plastic units due to lightweight is also a favorable factor.

Probably the most important outcome of the pioneering work done in lighting at New Haven is the fact that the minimum specifications of the United States Housing Authority lighting requirements were changed so that the central ceiling outlet is now ordered for the principal rooms. This will at least insure the tenant a source of light from a bare bulb, and may easily and economically be converted into an efficient source of light distribution.

Credits: Beetle urea molded by Bryant Electric Co. for Chase Brass & Copper Company.

B-19—air fleet leviathan

(*Continued from page 31*) gunner's compartment are likewise fabricated from transparent methyl methacrylate sheets, as are practically all of the transparent plastics which have been employed. Experience and testing, in some cases where a constant stress has been applied, have developed a detectable crazing in these materials. Where stresses occur (and this is objectionable), transparent cellulosic plastics have served as successful alternates.

A loud speaker communication system connects all stations on the B-19. This as well as the four radio transmitting and receiving sets rely on compression molded and laminated phenolic parts for their operation. Within the ship are 24 telephones.

The B-19 is to become literally a flying laboratory for assembling and checking structural and tactical information. It will also serve as a guide in the construction of the great cargo and troop transports of tomorrow. For special missions the B-19's battle stations can be manned by an extra crew, in addition to the normal flight crew of 10 men. It has been estimated that if the ship were outfitted as a troop transport it would carry 125 men.

According to an official Army announcement, "This airplane represents a further step toward solving the question of the best combination of size, speed, range, weight and carrying ability in view of the latest requirements for bombardment airplanes."

Plastics, with the other materials, are helping to make this all important practical B-19 test possible. And along with other materials, plastics will work in advancing future aircraft performance. Through its advantageous inherent physical dielectric and chemical properties. Plastics also enchance the beauty and streamlined appearance of this super bomber.

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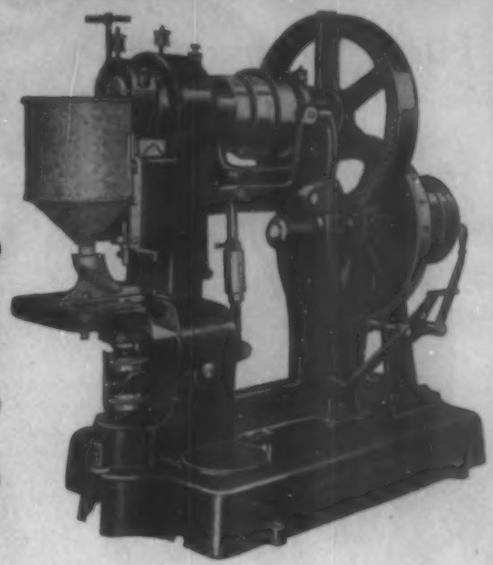

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(*Continued from page 44*) exclusive process on the part of the decorator was the fact that it is stain-proof, heat-resistant, permanently finished, easily cut and machined. The laminate is available in different finishes and thicknesses. Also important is that it presents a most striking and arresting appearance; incomparable to anything else. The bold use of flowers on the shiny surface gives character to the color scheme of sky-blue, cherry-red and white.

Mirrors accent the femininity of the shop. They are everywhere; set deep in baroque wood frames, or lining entire walls. The carpets covering the two floors and stairways are dyed porcelain-blue. Cherry-red leather covers many of the bleached wood chairs and the balustrade of the dramatic curving staircase.

Credits: Plasdecor design by Alice Donaldson. Dorothy Draper, decorator. Bakelite urea laminated by Mica Insulator Corp.

In the limelight

(*Continued from page 80*)

★ A STEP FORWARD IN MECHANICAL BINDING HAS been reached by the Tauber Tube Binding, 200 Hudson St., New York. They have made use of plastics for rings which range in size from 1/4 in. up to and including 1 in. The principle of the ring is simple. It is a coil made of plastic loops that fit into slotted holes as punched by the regular Tauber-Tube dies. One end of the coil is inserted into the slotted hole and then, with several twists, the ring spins into its proper place.

★ THE SECOND NATIONAL CHEMICAL EXPOSITION has been set for Oct. 27 to Nov. 1, 1942, at the Stevens Hotel, Chicago, says W. F. Henderson, Chairman of the Chicago Section of the American Chemical Society, 110 N. Franklin St. Early returns from the questionnaire sent along with the attendance report in January indicates that there will be a much larger plastics exhibit as well as a large increase in of chemical exhibitors.

★ D. V. MAHER HAS BEEN APPOINTED FACTORY superintendent in Ohio for Clover Manufacturing Co., Norwalk, Conn. He will have offices at 912 Marshall St., Cleveland, Ohio.

★ A NEWCOMER TO THE EXTRUSION MOLDING field is the Irwin Corp., 27 West 20th St., New York City. The company reports it can extrude acetate sheets from .015 in. to 10 in. wide as well as tubes, rods and strips.

★ EXPENDITURE OF APPROXIMATELY ONE-HALF million dollars for enlargement of its Mansfield, Ohio, plant is announced by the Westinghouse Electric and Mfg. Co. An expansion program totaling $1,500,000 has just been completed at the plant. The new expansion will include a $240,000 addition to the plant's present vitreous enameling building and a new enameling furnace to supplement the three now in operation.

★ ACCORDING TO AN OFFICIAL ANNOUNCEMENT by the Treasury Department, Americans are giving Uncle Sam $100,000,000 a week to save for them—and receiving in return Defense Savings Bonds and Stamps. Bankers, businessmen, bakers, farmers, factory workers, shop girls and housewives are cooperating in the Government program to build up a rainy-day reserve. In many states, employers are establishing systematic savings plans in cooperation with their employees.

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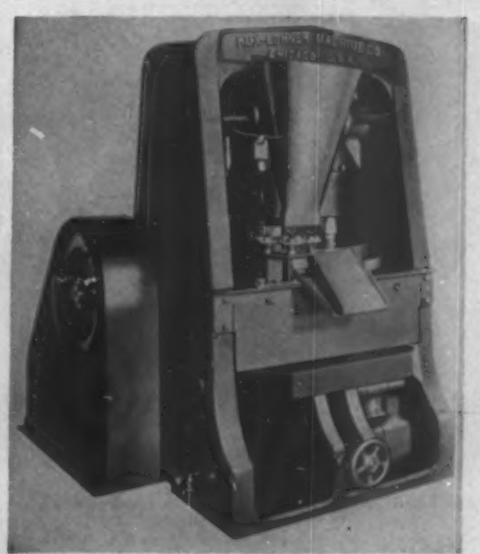

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U. S. plastics patents

(Continued from page 70)

LIGNOCELLULOSE MOLDINGS. A. W. Schorger (to Burgess Cellulose Co.). U. S. 2,247,207–8–9–10, June 24. Plasticizing a lignocellulose thermoplastic with lignin deposited from an organic solvent; compacting a lignocellulose plastic under heat and pressure before grinding it to a molding powder; compounding a lignocellulose plastic with 1 to 15 percent of aniline; and extracting a thermoplastic lignin from a lignocellulose plastic with an organic solvent.

CREASEPROOFING FABRICS. Laszlo Auer. U. S. 2,247,353, July 1. Impregnating textiles with cyanamid and resinifying the cyanamid by condensation with formaldehyde.

ROSIN POLYMER. R. C. Palmer and C. H. Bibb (to Newport Industries, Inc.). U. S. 2,247,399–400, July 1. Polymerizing rosin in solution in presence of zinc chloride; and forming a high melting nuclearly hydrogenated rosin polymer.

CRESOL RESIN. F. Rostler, V. Mehner and L. Bornstein. U. S. 2,247,411, July 1. Condensing cresol with formaldehyde in presence of unsaturated hydrocarbons derived from petroleum acid sludge.

MODIFIED UREA RESIN. H. J. Tattersall (to Imperial Chemical Industries, Ltd.). U. S. 2,247,422, July 1. Condensing urea with a dicarboxylic acid and a monohydric alcohol, then condensing the product with formaldehyde.

MOLDING HOLLOW ARTICLES. C. C. Warren (one-fourth to R. G. Saunders and one-half to J. A. Jennings). U. S. 2,247,537, July 1. Apparatus for molding seamless hollow objects has a hollow core and an outer shell, each with its wall formed in segments.

FORMING INLAYS. Edgar B. Nichols. U. S. 2,247,558, July 1. Securing an inlay to a hard plastic base by heating the base locally where it contacts the anchoring pins of the inlay, and forcing the pins into the softened base.

PATCHING VENEERS. Jas. V. Nevin. U. S. 2,247,764, July 1. A binder for patching veneers is made with a urea-cresol-formaldehyde resin, a borate, a polyhydric alcohol plasticizer and a phosphate in aqueous dispersion.

CASTING RESIN. G. F. D'Alelio (to General Electric Co.). U. S. 2,247,772, July 1. Catalyzing a single-stage phenol-formaldehyde condensation reaction with a mixture of an amine-carboxylic acid and a salt thereof.

CHLOROACRYLATE RESIN. F. Strain and M. A. Pollack (to Pittsburgh Plate Glass Co.). U. S. 2,247,790, July 1. Preventing color formation while polymerizing a chloroacrylate by excluding water from the system.

COLOR STABLE RESIN. W. H. Carmody (to Neville Co.). U. S. 2,247,940, July 1. Preventing after-yellowing of a naphthaleneformaldehyde resin by hydrogenating the resin sufficiently for color stabilization but not far enough to degrade the resin molecule.

TREATING WELLS. C. F. Prutton (to Dow Chemical Co.). U. S. 2,248,028, July 1. Forcing a resinifiable liquid through a casing into a well bore so that it rises and fills the annular space between the casing and the well bore, then after the resin has set drilling holes through the casing and the resin lining of the well bore so that liquid from the surrounding formation will enter the casing.

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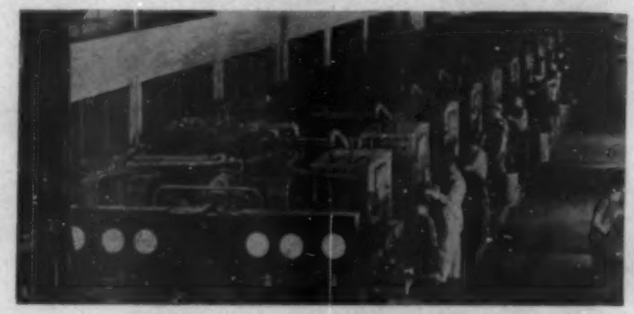

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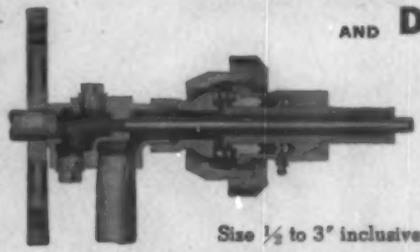

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